DOCUMENT RESUME

ED 355 619 EA 024 696

TITLE	Exercise Manual: Educational Policy Analysis Training Workshop.
INSTITUTION	Florida State Univ., Tallahassee. Learning Systems Inst.; Howard Univ., Washington, D.C.; Improving the Efficiency of Educational Systems Consortium.; Institute for International Research, Inc., McLean, VA.; State Univ. of New York, Albany.
SPONS AGENCY	Agency for International Development (IDCA), Washington, DC. Bureau of Science and Technology.
PUB DATE	Jan 88
CONTRACT	DPE-5823-C-00-4013-00
NOTE	114p.
PUB TYPE	Guides - Non-Classroom Use (055) -- Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	*Developing Nations; *Educational Assessment; *Educational Development; *Educational Policy; Elementary Secondary Education; Foreign Countries; Group Dynamics; Workbooks; Workshops
IDENTIFIERS	Improving the Efficiency of Educ Systems Project

ABSTRACT

The Educational Policy Analysis Training Workshop is designed to provide training in quick response analysis to typical policy issues encountered in developing countries. The workshop emphasizes working in small groups, approaching problems from a variety of analytic standpoints and presenting understandable and persuasive conclusions for use by policymakers unfamiliar with quantitative techniques. This exercise manual helps teach the analytical and technical skills necessary to conduct the educational policy analyses that are contained in the case studies. Each of the nine sets of exercises utilizes a case study concerned with improving the "quality" of primary school teachers in a particular developing country. The exercises are: Understand the Problem, Plan the Analyses, Describe the Current Situation, Restate the Problem, Generate and Narrow Alternatives, and Prepare Final Report. The exercises are done in small groups of four to eight people with a facilitator for each group. The groups read and discuss the exercises and subexercises, reach conclusions, and present a written report and an oral presentation on the case study. (JPT)

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EDUCATIONAL POLICY ANALYSIS TRAINING WORKSHOP

Exercise Manual

January 1988

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The Florida State University
Howard University
Institute for International Research
State University of New York at Albany
United States Agency for International Development
Bureau for Science and Technology
Office of Education
Contract No. DPE-5823-C-00-4013-00

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Improving the Efficiency of Educational Systems (IEES) is an initiative funded in 1984 by the Agency for International Development (AID), Bureau for Science and Technology, Office of Education. The principal goals of the IEES project are to help developing countries improve the performance of their educational systems and strengthen their capabilities for educational planning, management, and research. To achieve these goals, a consortium of U.S. institutions has been formed to work collaboratively with selected host governments and USAID Missions for ten years. The consortium consists of The Florida State University (prime contractor), Howard University, the Institute for International Research, and the State University of New York at Albany.

There are seven countries working with the IEES initiative to improve educational efficiency: Botswana, Haiti, Indonesia, Liberia, Nepal, Somalia, and Yemen Arab Republic.

Documents published by IEES are produced to promote improved educational practice, planning, and research within these countries. All publications generated by project activities are held in the IEES Educational Efficiency Clearinghouse at The Florida State University. Requests for project documents should be addressed to:

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Bureau for Science and Technology
Office of Education
Contract No. DPE-5823-C-00-4013-00
Project No. 936-5823

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Contract No. DPE-5823-C-00-4013-00

Second Printing
June 1988

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ACKNOWLEDGEMENTS

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Exercise Manual

INTRODUCTION

Overview

Overview

The Educational Policy Analysis Training Workshop has as its primary purpose to provide training and experience in quick response analysis to typical policy issues encountered in developing countries. There are emphases on the skills of working in small groups, approaching problems from a variety of analytic standpoints, and presenting conclusions in ways that will be understandable and persuasive to busy policy makers who are not fully familiar with quantitative techniques. The workshop is directed towards civil servants concerned with education, but policy analysts in areas other than education will benefit from it as well.

The workshop consists of three components, which are modularized. That is, facilitators may choose to use any or all components, depending on the needs of the participants:

Group Dynamics Training

Group Dynamics Training

The goal of this set of exercises is to learn techniques of small group work. Skills such as brainstorming, buzz sessions, and reaching consensus are included in this section. Since the case study and exercise portions of the workshop emphasize group decision making, participants will find the group training section extremely useful for the successful completion of subsequent phases of the workshop.

Exercises for Skill Development

Exercises for Skill Development

The goal of this set of exercises is to learn the analytical and technical skills necessary to conduct the educational policy analyses which are contained in the case studies.

There are nine sets of exercises, each with subsections. The exercises are framed around a case study which deals with the question of improving the "quality" of primary school teachers in a particular developing country. The format is the same for each exercise:

- The lead facilitator introduces the exercise.
- Break up into smaller groups of 4 to 8 persons, with a facilitator for each group.
- Read and discuss among the group the explanatory materials at the beginning of each sub-exercise.
- Read and discuss among the group the example for each subexercise.
- Read and discuss among the group the task for each subexercise.
- Complete the task for each subexercise.
- Present the product to the facilitator for evaluation and discussion.
- After the subsections of an exercise are completed, subgroups come back together for review, discussion, and introduction to the next exercise.

When all nine exercises are completed, your product will be a written solution to the case study, which is a memorandum written to the Minister responding to his policy analysis request. You will also prepare an oral presentation to the Minister.

With all members present, you will present your oral report at a plenary session. Other participants and facilitators will critique and evaluate each group's report.

Unstructured Case Study Analysis

Unstructured Case Study Analysis

The goal of this section is to provide the experience of working through a realistic educational policy analysis problem as a group, utilizing the analytical skills you have acquired through the exercises.

A topic for this case study is provided, as well as a considerable amount of quantitative and qualitative data derived from an actual country, Botswana, in southern Africa. Most of the data are drawn from the sector assessment conducted by the Improving the Efficiency of Educational Systems project, funded by the United States Agency for International Development. Some data have been "invented" in order to facilitate the case study analysis.

Alternatively, a case study topic and data from the country in which the workshop is being held may be used. The problem-solving methodology presented in the exercises is universally applicable. The advantages to solving an indigenously produced case study are relevance, currency, and realism.

Materials

Materials

There are two volumes which comprise the Educational Policy Analysis Training Workshop:

The Exercise Manual, which includes the following sections:

- Introduction
- Exercises 1-9

The Case Study Data Volume, which includes the second case study statement and qualitative and quantitative data for solving the second case study.

Read this Passage First

Unemployment is the major economic problem of our time. The waste of talent and energy that occurs as a result of unemployment is unforgivable in the modern world. When the problem affects young people, it becomes even worse. Young people above all need to feel that they can contribute to society and that their education will open the world's doors to them. When they find, on the contrary, that work done in school seems to have been for nothing, is it any wonder that they adopt a pessimistic outlook, and that young people coming after them do not see the point in education if there are no jobs anyway? The result, of course, is apathy and low achievement in school, which will be reflected in the quality of the labor force of the future. Students should leave school with a satisfactory level of literacy and numeracy.

This is why education and employment are so closely linked. Education should give young people the basic tools that they need to participate as full citizens in society and, in cooperation with vocational training, it should prepare them for specialized activity in the world of work. It should keep pace with society's main trends and reflect changes in economic life and practices. What do we see education doing for young people now, in a time of serious unemployment, of which youth unemployment forms a disproportionate part? We see a lack of job opportunities for youth. Considerations of objective phenomena can dictate modifications of domestic programs. These are elements of the educational and youth employment problems that have gone hand-in-hand with unemployment.

1

UNDERSTAND THE PROBLEM

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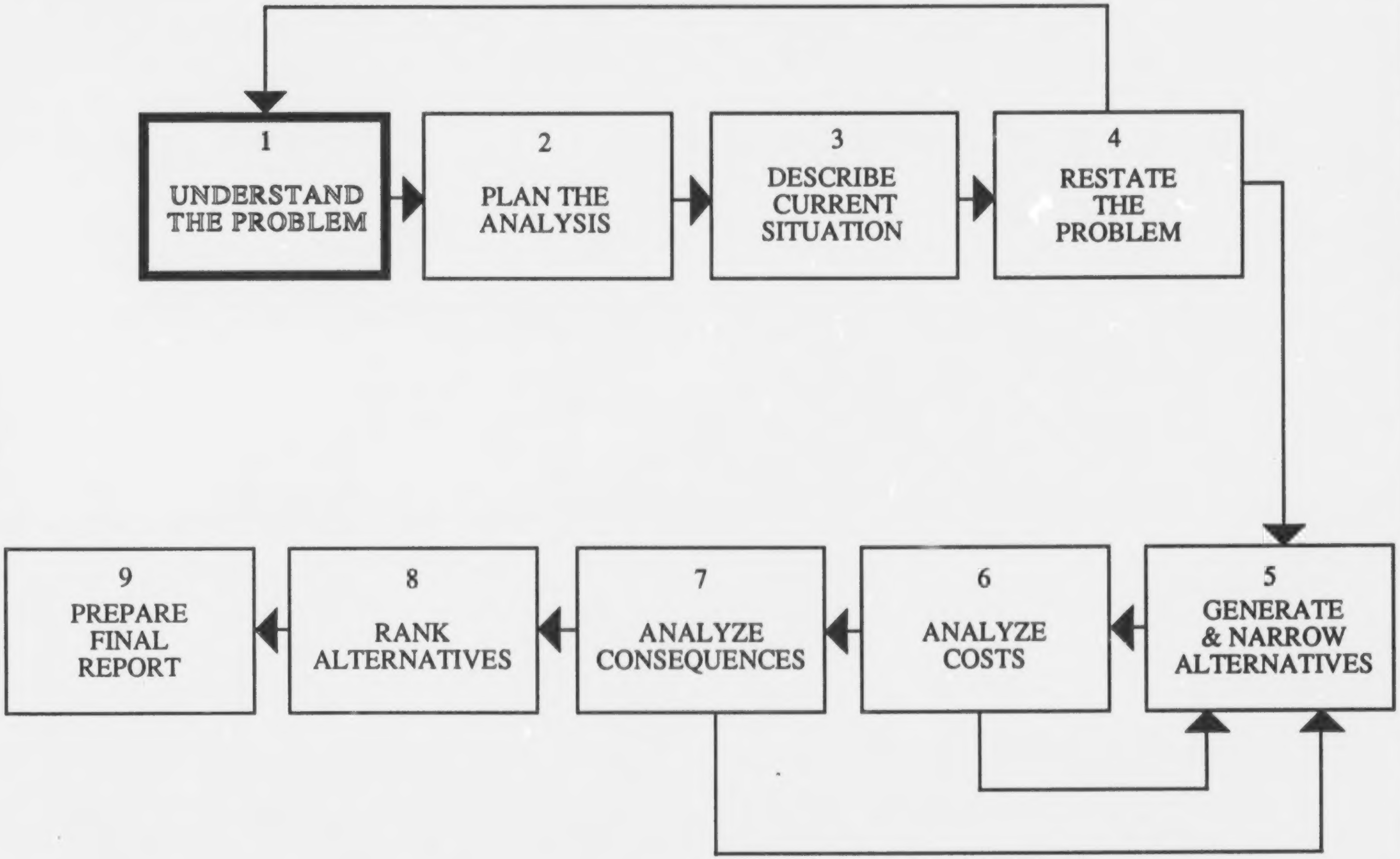

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STEP 1
UNDERSTAND THE PROBLEM

OBJECTIVE 1.1

Identify and State the Main Points of the Passage

OBJECTIVE 1.2

Identify Stated and Unstated Assumptions

OBJECTIVE 1.3

Separate Verifiable Assumptions From Unverifiable Assumptions

OBJECTIVE 1.1

Identify and State The Main Points of the Passage

TO IDENTIFY AND STATE THE MAIN POINTS OF THE PASSAGE.

Explanatory Text

One of the basic skills in critical thinking is the ability to identify the central issue or main theme. In order to adequately address a policy-related issue or request, one must first agree on what the precise problem is. This can be more difficult than it sounds.

Issues of policy, and especially ones which are related to educational reform, are typically situated in a politicized context, and are characterized by ideological controversy and rhetorical argumentation. Thus, the central issues are rarely clear as written. Rather they will be hidden in many words, or they may be unstated entirely.

Example

In the passage you read on page 3, the central point may be stated as:

"Education is partially responsible for unemployment—the major economic problem of our time."

TASK

As a group, read the Case Study statement below and write a short paragraph stating the main points of the Minister's memo.

Case Study One: Problem Description

MEMORANDUM

TO: Educational Planning Division

FROM: Minister of Education

RE: Reform of Primary Teacher Training

There has been growing concern in developing nations concerning the quality of teaching at the primary school level, since primary education is the most important ingredient for national development. Recently, an international agency has developed a primary teacher competency examination which has been administered in seven countries in our region. The exam consists of two sections: the first is a written portion which covers "professional knowledge," including pedagogical theories and practice, subject matter expertise, and child development. In the second part of the examination, teachers are rated by observers on their classroom performance. Teachers are scored on such behaviors as interaction with students, giving positive feedback for correct answers, use of the blackboard, clarity of presentation, and so on.

The results of the exam have just been released, and our country compares unfavorably with the others: it had the second lowest score. These results, compounded with growing dissatisfaction expressed by individual parents, by primary school headteachers, by secondary school teachers and headteachers, and by organizations of parents, have prompted me to launch a reform program to improve teacher quality.

Representatives of the primary school teachers, while not wishing to accept full responsibility for this problem, do concede that there is a possibility that the average quality of primary school teachers is lower than desirable because of the high proportion of untrained teachers in the primary schools. This is crucial, since it is teachers who hold the major burden for educating our youth. I am meeting next week with a delegation that includes parents, secondary school teachers, primary school headteachers, and members of the National Assembly. The delegation and the meeting has been organized by a member of the National Assembly-who takes a keen interest in education matters and who is known to be a critic of the quality of the primary school teaching force (he himself had been a primary school teacher before independence). You will be accompanying me to the meeting and have been informed that after the initial formalities, you will make a presentation of the Ministry's position.

Your task now is to prepare a report for me that addresses the following issues:

(1) Is there good reason to believe that the high proportion of untrained primary teachers is the major reason for the poor results on the competency examination?

(2) If so, what measures can be recommended that may have the effect of improving the primary teacher competency examination results without increasing the Ministry's expenditures on teacher training (both inservice and preservice) by more than twenty percent?

(3) Are there other plausible explanations for the relatively low performance of the teachers, which may not be related to formal training?

I am instructing you to prepare a written report of not more than about two to three pages, and to present the major points in it to him orally. If I approve of the content of your report and presentation, you will make the presentation to the delegation and I will use your report as background material for the discussion that will follow with the delegation. The report can have appendices giving more detail on the evidence behind its conclusions, and in fact that would be useful reference for the discussion. If there are matters on which you cannot come to firm conclusions, it would also be useful to have in an appendix suggestions about information that the Ministry should collect in the future in order to be able to come to more firm conclusions about such matters if they arise again; this will be essential in order to answer the National Assembly members' anticipated criticisms if the Ministry is forced to say it is not sure of an answer.

OBJECTIVE 1.2

To Identify Stated and Unstated Assumptions

Identify Stated and Unstated Assumptions

Explanatory Text

An argument is always based upon certain assumptions, and these are rarely stated explicitly. Assumptions are concepts which must be true in order for the statement to be true. One way to describe assumptions would be to call them "what we take for granted," or "what we do not feel obliged to prove."

Assumptions may be generally accepted by everyone, they may be disagreed upon by different cultural groups or by different political factions, or they may be absolutely untenable. In order to perform a satisfactory analysis of a policy issue, the underlying assumptions of the various interested parties must be made explicit. Furthermore, one's own assumptions must be identified as well.

Example

In the passage on education and unemployment, there are numerous assumptions, both stated and unstated. Here are a few examples:

"Unemployment is the major economic problem of our time."
"Students who find out that work in school is 'for nothing' adopt a pessimistic outlook."

TASK

In the Case Study statement, identify four assumptions, either stated or unstated. Keep a record of these for your future analysis.

Separate Verifiable Assumptions From Unverifiable Assumptions

OBJECTIVE 1.3

TO SEPARATE VERIFIABLE ASSUMPTIONS FROM UNVERIFIABLE ASSUMPTIONS

Explanatory Text

Explanatory Text

Assumptions may be essential and relevant to the main point, but they still may not support a generalization purportedly built upon them. If a crucial assumption is either demonstrably false, or not widely accepted, then the plausibility of the main point will be negated. The ability to separate the verifiable from the unverifiable is important in order to identify those conclusions that are, or can be, supported by facts.

It has been argued by some that a statement that cannot, in principle, be falsified has no meaning. Even though a statement may appear to say something, it may be so loosely related to facts or experience that its truth is hard to assess. Some assumptions may be evaluated through the collection of social data, such as that students are learning less in school than they used to— collect indicators of learning over a long time period. Other assumptions may be evaluated through the collection of opinion data, such as the public is dissatisfied with our national educational system— conduct a survey of public opinion. Other assumptions, however, do not lend themselves to empirical appraisal, such as that schools should prepare children for the changing world of work— there is such disagreement on this issue that one would not want to build an argument around it.

Example

Example

Some unverifiable assumptions in the passage include:

"Unemployment is the major economic problem of our time."

"Unemployment in unforgivable in the modern world."

Some verifiable assumptions in the passage include:

"Students who find out that work in school is 'for nothing' adopt a pessimistic outlook."

"We see a lack of job opportunities for youth."

Task

TASK

Identify two verifiable and two unverifiable assumptions in the Case Study statement. Keep a record of these for your future analysis.

2

PLAN THE ANALYSIS

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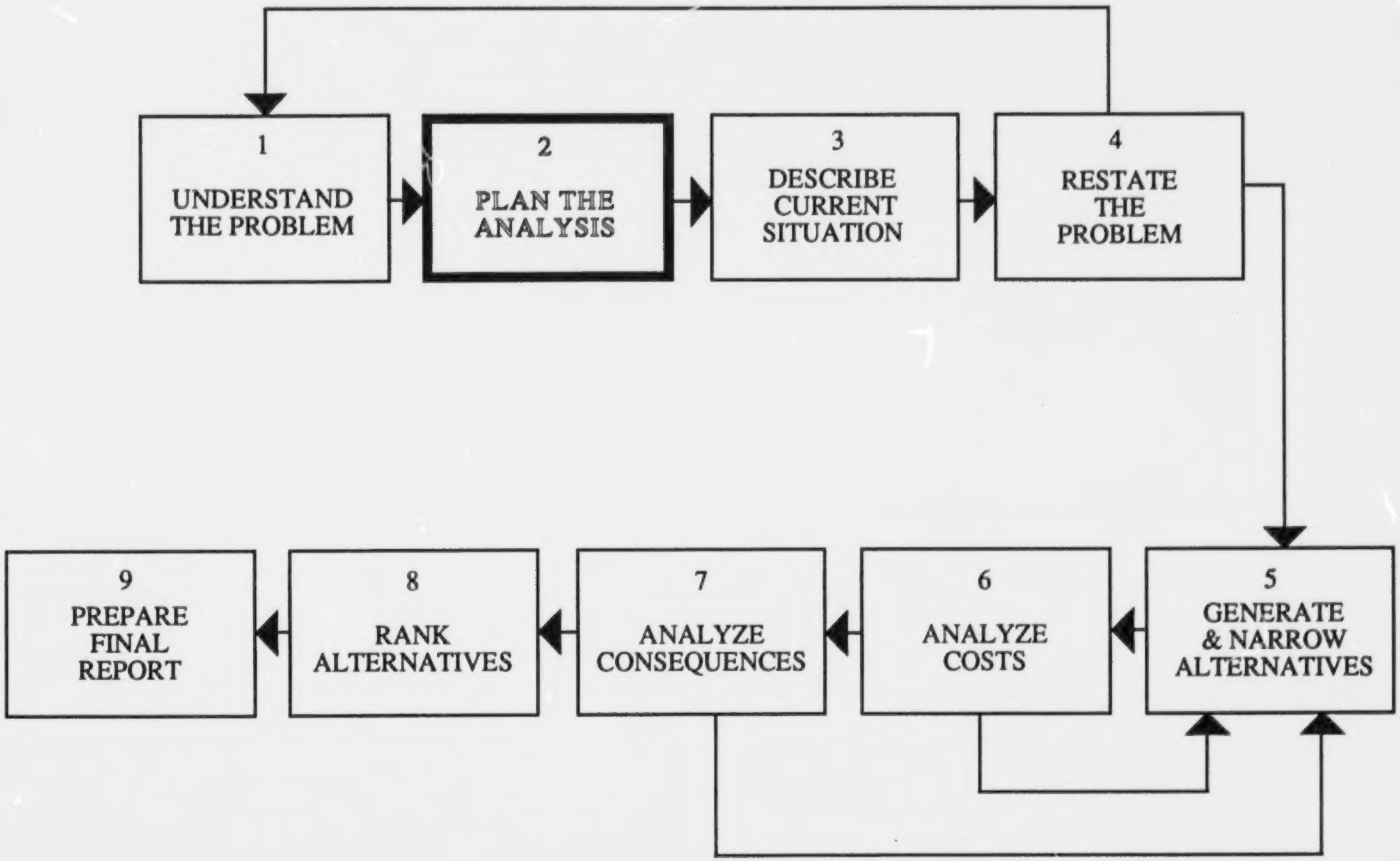

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PREPARE FINAL REPORT

STEP 2
PLAN THE ANALYSIS

OBJECTIVE 2.1

Define Terms and Concepts

OBJECTIVE 2.2

Operationalize the Terms Defined

OBJECTIVE 2.1

TO DEFINE TERMS AND CONCEPTS

Define Terms and Concepts

Explanatory Text

Explanatory Text

It is common, especially in everyday or political usage, for terms to be left undefined or to be only vaguely defined. Different actors may appear to be focusing on the same issues because they are using the same words. However, when it comes to implementing goals upon which all actors seem to agree, one often discovers that people had very different meanings for the same term.

A definition is a statement of the precise meaning or significance of a word, phrase, or term. When policy decisions have to be made, it is always essential to define terms precisely, in order to avoid confusion, miscommunication between officials, and implementation errors.

Example

Example

In the passage you read above, the notion of **basic skills** needed for adult society might be defined as being comprised of **literacy, numeracy**, and **social skills**. These, in turn, would need to be defined.

Literacy could be defined in various ways:

- The ability to write one's name
- The ability to pass a particular reading test
- The ability to fix a machine by reading a manual

Numeracy could also be defined in various ways:

- The ability to pass a certain mathematics exam
- The ability to make change in a store
- The ability to balance a checkbook

Social skills could also be defined in various ways:

- The ability to act properly in a particular social context
- The ability to act properly in a particular work context
- The ability to adapt to new social situations

TASK

Task

Continuing with the main point of the Case Study statement, provide three definitions of teacher quality, as a group. Keep a record of these for your future analysis.

OBJECTIVE 2.2

Operationalize Terms and Concepts

To Operationalize the Terms or Concepts Which Have Been Defined

Explanatory Text

Explanatory Text

Although policy analysts may agree in principle on the definition of a given term, definitions must be made specific enough for their use in the decision-making context. Successful evaluation of policy decisions requires monitoring levels of policy implementation and effectiveness of outcomes. This requires that the objectives of policy be expressed in terms of criteria that are useful for operational purposes.

Such operational definitions are often defined in quantitative terms. That is, a method must be specified for the measurement of the defined term, and a criterion must be specified for knowing at what level the definition has been reached.

Operational definitions may also be qualitatively described. In this case, a method or agenda for observing the phenomenon under study must be specified, again with a criterion for determining whether the definition has been reached.

Example

Example

In the case of the definitions of literacy listed above, each could be operationalized as follows:

- The ability to write one's name
  A person is asked to write his or her name. If two observers can successfully read the name, the person is defined as literate.

- The ability to pass a particular reading test
  A particular reading test is administered to a person. If the person scores sixty-five percent or higher, he or she is defined as literate.

- The ability to fix a machine by reading a manual
  A particular machine with one broken part is presented to the person. The person is given the repair manual. If the person fixes the part, he or she is considered literate. (The person cannot have had previous experience with this type of machine.

Task

TASK

As a group, take the three definitions of teacher quality which you developed above, and operationalize each one. Keep a record of these for your future analysis.

3

DESCRIBE CURRENT SITUATION

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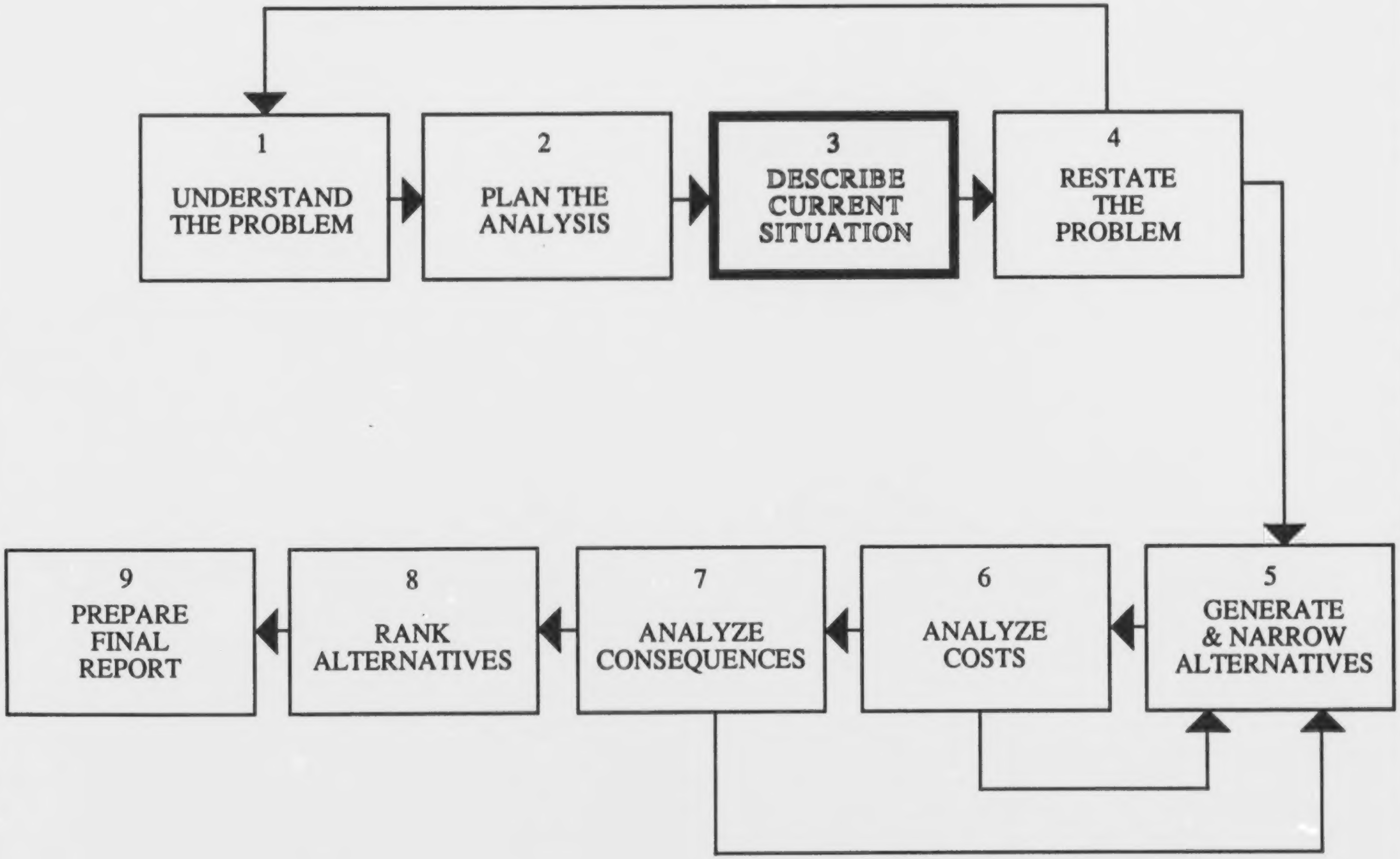

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STEP 3
DESCRIBE THE CURRENT SITUATION

OBJECTIVE 3.1

Interpretation of Univariate Statistics

OBJECTIVE 3.2

Find Internal Inconsistencies in a Statistical Table

OBJECTIVE 3.3

Interpretation of Bivariate Statistics

OBJECTIVE 3.4

Spurious Correlations

OBJECTIVE 3.1

INTERPRETATION OF UNIVARIATE STATISTICS

Interpretation of Univariate Statistics

Explanatory Text

Explanatory Text

Policy analysts are often requested to obtain, present, and analyze quantitative data relevant to particular policy and planning issues. More often than not, available data are not in a form which speaks directly to the issues at hand, but have to be modified or recalculated into summary statistical measures in order to be meaningful. The decision as to how to modify data will bear directly on the conclusions that will be drawn. Three basic ways to recalculate statistics with descriptive data are:

(1) to compute means (or averages)
(2) to compute medians
(3) to compute percentages or ratios.

The **mean**, or average, is one statistic often used to describe central tendencies of a particular quantity. The mean is computed by summing the variable across all the cases, and then dividing the sum by the number of cases.

The **median** is another statistic used to describe central tendency. It is simply the numerical value of the middle case, once all the cases have been rank ordered from highest to lowest. It is different from the mean, in that it is less affected by the presence of extremely high or low scores in the data.

Percentages and **ratios** are computed variables which can render comparisons among cases more meaningful than if simple raw numbers are used. Ratios are often expressed using the word per, e.g., **per** pupil expenditures. Ratios are computed by dividing one variable by another. Percentages are simply ratios multiplied by 100.

Example

Example

Districts

Estimates of Local Government Expenditures on Primary Schooling

Districts	Expend. Primary Schooling	Total Expend.	% Expend. on Primary Schooling
Central	1,440,100	7,950,620	18
Ghanzi	180,500	1,560,020	12
Kgalagadi	140,700	1,600,200	9
Kgatleng	320,500	1,520,410	21
Kweneng	450,110	2,750,500	16
North East	240,550	1,305,420	18
North West	350,420	2,450,520	14
South East	205,200	1,190,250	17
Southern	630,750	3,200,200	20
Total Districts	**3,958,830**	**23,528,140**	17
Mean-Districts	**439,870**	**2,614,238**	
Median-Districts	**320,500**	**1,600,200**	

Towns

Towns	Expend. Primary	Total Expend.	% Expend. on Primary
Francistown	108,880	2,400,080	5
Lobatse	95,400	1,505,520	6
Selebi-Phikwe	181,600	2,650,620	7
Gaborone	422,400	5,570,720	8
Total-Towns	**808,280**	**12,126,940**	7
Mean-Towns	**202,070**	**3,031,735**	
Median-Towns	**145,200**	**2,525,350**	

Grand Mean	**366,701**	**2,742,698**	
Grand Median	**240,550**	**1,600,200**	
Grand Total	**4,767,110**	**35,655,080**	13

Note how the statistics were computed in the example table:

For the mean local government expenditures on primary schools for all districts and towns, the figures in the first column of expenditures were summed (a), and the sum divided by the total number of districts and towns, 13 (b):

a) 1,440,100 + 180,500 + 140,700 + ... + 422,400 = 4,767,110

b) 4,767,110 / 13 = **366,701**

For the median, the expenditures for all 13 towns and districts were arranged in ascending order, and the middle district is defined as the median, that is the seventh:

Also notice that the median is considerably lower than the mean, and is probably a more realistic description of the "average" expenditure. This is because the effect of the large expenditures in the Central district is minimized.

1	95,400	Lobatse
2	108,880	Francistown
3	140,700	Kgalagadi
4	180,500	Ghanzi
5	181,600	Selebi-Phikwe
6	205,200	South East
7	**240,550**	**North East**
8	320,500	Kgatleng
9	350,420	North West
10	422,400	Gaborone
11	450,110	Kweneng
12	630,750	Southern
13	1,440,100	Central

The **percentage** of total district or town expenditures which is spent on primary schooling is computed by (a) dividing the primary school expenditures by total expenditures, and then (b) multiplying the result by 100. For example, in the Central district:

a) 1,440,100 / 7,950,620 = 0.18

b) 0.18 x 100 = **18%**

Notice that the percentages reveal a great discrepancy between the districts and towns in the proportion of their total expenditures which are devoted to primary education.

TASK

Task

Continuing with the Case Study example, complete the following table:

- Compute the mean number of primary teachers who are certified, and the mean uncertified.
- Compute the median number of primary teachers who are certified, and the median uncertified.
- Compute the percent certified in each town and district.
- Write a statement describing your findings, including the mean percentage of certified teachers countrywide, the range of percent certified (lowest to highest), and anything else you find noteworthy from this table.

Numbers of Teachers by Qualification
by Town and District

	Uncertified	Certified	%Certified
Districts			
Central	648	1557	
Ghanzi	39	89	
Kgalagadi	67	123	
Kgatleng	114	245	
Kweneng	234	513	
North East	127	206	
North West	167	311	
South East	29	162	
Southern	279	593	
Towns			
Francistown	24	151	
Lobatse	19	100	
Selebi-Phikwe	29	104	
Gaborone	118	250	
Total	1894	4404	
Mean			
Median			

Find Internal Inconsistencies in a Statistical Table
Explanatory Text

OBJECTIVE 3.2

TO FIND INTERNAL INCONSISTENCIES IN A STATISTICAL TABLE

Explanatory Text

Statistical tables often have errors in them, which can arise for many reasons. It is always worthwhile to quickly check tables for internal consistency. There are a number of things one can look for:

- Do elements add to totals as they should?
- Have percentages been correctly calculated?
- Are there obvious discontinuities in particular series, e.g. sudden jumps In time-series, or strong outliers in other series? Are there any obvious explanations for any such discontinuities?

- Do the numbers make sense, i.e. if one thinks of the numbers as concrete realities, are they plausible or are they saying something which is not in accordance with what we would expect from personal knowledge? If there is such an implausibility, can one find an explanation for it in terms of changes in definitions, changing method of data collection, or something else?

- If inconsistencies have been found, how important are they? What do they imply for use of the table? Is there still useful information in the table, although some of the data in it have to be rejected?

Example

Example

There are four errors in the following table, which become apparent after close scrutiny:

a) The numbers of students enrolled in primary school are consistently higher than the number of children in the primary age group. One can surmise that the headings for these columns have been mistakenly switched, especially since the percent enrolled is consistent with this interpretation.

b) In the second column, the school age population in the North East district is impossibly high (64,959) compared with the other figures for this district. Similarly, the number below it (9,135) is impossibly low for the Central district. Upon closer examination, it is clear that these figures have been inverted.

c) The percentage of the school age population not enrolled in primary school in 1981 for the Kweneng district (74.8) is unusually high, and unreasonably different from the next year and from all other districts. After recalculating the percentage, one can see that this is actually the percentage **enrolled**. The correct figure should be 25.2.

d) The total number of children enrolled in primary school in 1982 (1,827,360) is unreasonable, as it is ten times greater than the number of children in the age group. After adding the numbers in the column, one sees that a zero has been inadvertently added to the correct figure (182,736).

	Population in Age Group		Percent of Age Group Not Enrolled		Primary Enrollment	
	1981	I982	pct81	pct82	1981	1982
Districts						
NE	8,391	**64,959**	21.3	18.4	10,662	11,195
Central	59,535	**9,135**	15.7	12.4	70,623	74,154
Kgatleng	9,270	9,928	24.9	23.4	1,234	12,961
Kweneng	20,976	22,349	**74.8**	24.1	28,043	29,445
Southern	23,619	25,025	22.8	22.1	30,595	32,124
South East	5,643	6,006	26.9	25.9	7,719	8,105
Kgalagadi	4,732	5,021	24.6	23.8	6,276	6,590
Ghanzi	2,839	3,043	28.4	26.9	3,965	4,163
North East	12,569	13,371	24.1	23.1	16,559	17,387
Towns						
Gaborone	9,231	10,203	16.5	12.1	11,055	11,608
Francistown	5,213	5,776	14.9	10.2	6,125	6,432
Lobatse	3,522	3,801	17.2	14.9	4,254	4,466
Selebi-Phikwe	3,737	4,119	15.6	11.4	4,427	4,649
Total	169,276	**1,827,360**	21.4	19.1	212,647	223,279

TASK

Task

There are two errors in the table below. Identify them and offer plausible corrections for them.

MINISTRY OF EDUCATION RECURRENT EXPENDITURE BUDGET
1982-83/1983-84
(Current Price, Thousand Pula)

Activity/Department	1982-1983 Amount	1982-1983 Percent	1983-1984 Amount	1983-1984 Percent
Headquarters	6,238.0	12.3%	5,913.0	10.8%
Department of Technical Education	2,177.6	4.3	2,351.1	4.3
Bursaries	6,469.3	9.9	5,011.1	11.8
Dept. of Non-Formal Education	590.9	1.2	658.6	1.2
Dept. of Curriculum	752.4	1.5	825.2	1.5
Dept. of the Unified Teaching Service	28,769.6	56.9	30,646.1	56.0
Dept. of Primary Education	575.6	11.4	692.0	1.3
Dept. of Secondary Education	5,539.3	11.0	6,182.9	11.3
Dept. of Teacher Training	926.6	1.8	1,001.9	1.8
Total	**50,580.9**	**100.0**	**54,740.0**	**100.0**

Source: Financial Statements, Tables and Estimates of Consolidated and Development Fund Revenues, 1983-1984.

OBJECTIVE 3.3

Interpretation of Bivariate Statistics

INTERPRETATION OF BIVARIATE STATISTICS

Explanatory Text

Explanatory Text

The purpose of bivariate statistics is to examine the degree of association between two variables. There are countless examples of bivariate analysis in policy research. Such examples include:

"What is the relationship between teacher qualifications and student performance?"

"What is the difference in sex composition of the teaching force in rural and urban districts?"

It should be emphasized that if an association exists, one may not conclude that one factor causes the other. Rather, a bivariate association demonstrates that two quantities seem to be related, but it may well be the case that a third, unexamined, factor may be the cause of both of them.
Two methods of examining bivariate relationships will be discussed here: crosstabulation tables and bivariate scatterplots.

Crosstabulation tables are appropriate for variables which represent distinct categories, such as gender, level of training, or rural-urban status. They are constructed by laying out a table with one dimension across the top and another dimension along the left side. The resultant cells are filled in by counting the occurrences for each cell of the table. Finally, percentages of rows and columns are then computed and entered into each cell.

Example

Example

SEX OF TEACHERS BY TOWNS AND DISTRICTS

	Towns	Districts	Totals
Females	total=695 column %=87 row %=15	total=4106 column %=75 row %=85	total=4801 column %=76 row %=100
Males	total=100 column %=13 row %=7	total=1397 column %=25 row % =93	total=1497 column %=24 row %=100
Totals	total=795 column %=100 row %=12	total=5503 column %=100 row %=87	total=6298

The most interesting finding in this crosstabulation is that the percentage of male teachers is almost twice as high in districts than in towns.

Task

TASK

Using the data from the following table, which you used previously, complete the crosstabulation table breaking down percent certified teachers by districts and towns. Notice how much clearer the discrepancy between teacher qualifications in districts and towns is represented in the crosstabulation table.
Write a statement detailing the differences in teacher certification between towns and districts.

Numbers of Teachers by Qualification by Town and District

	Uncertified	Certified
Districts		
Central	648	1,557
Ghanzi	39	89
Kgalagadi	67	123
Kgatleng	114	245
Kweneng	234	513
North East	127	206
North West	167	311
South East	29	162
Southern	279	593
Towns		
Francistown	24	151
Lobatse	19	100
Selebi-Phikwe	29	104
Gaborone	118	250
Total	1894	4404

TEACHER QUALIFICATION BY TOWNS AND DISTRICTS

	Towns	Districts	Totals
Certified	total= column %= row %=	total= column %= row %=	total= column %= row %=
Uncertified	total= column %= row %=	total= column %= row % =	total= column %= row %=
Totals	total= column %= row %=	total= column %= row %=	total=

Explanatory Text

Explanatory Text

Bivariate scatterplots are appropriate for data which can be expressed in continuous or interval numbers, such as number of dropouts, enrollment figures, expenditures, etc. Scatterplots are drawn on graph paper by first laying out one variable along the horizontal axis and the other along the vertical. Each case is then plotted at the intersection of the two values.

A statistic called the correlation coefficient may be applied to bivariate scatterplots. While we will not discuss the computation of the correlation coefficient, it is good to know something about it. When two variables are perfectly related to each other (that is, when one goes up, the other goes up), the correlation coefficient is defined to be 1. When two variables are perfectly related, but as one goes up the other goes down, it is defined to be -1. If two variables are apparently unrelated, the coefficient is defined to be 0.

Example

Example

Three scatterplots have been drawn from the data on the following page:

a) Student age against percent who graduate from primary school (no correlation).

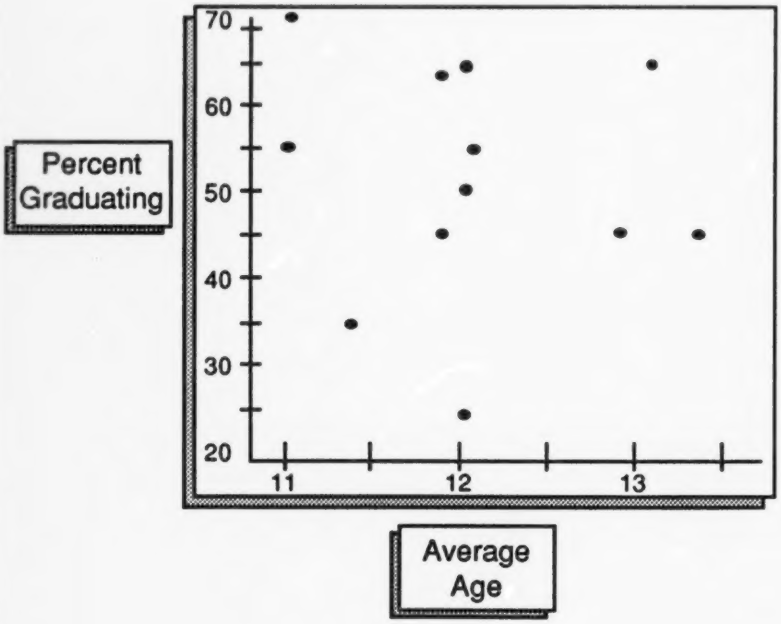
b) Number of secondary schools in districts against number of students enrolled in the district (positive correlation).

c) District income of families against percent of students dropping out (negative correlation).

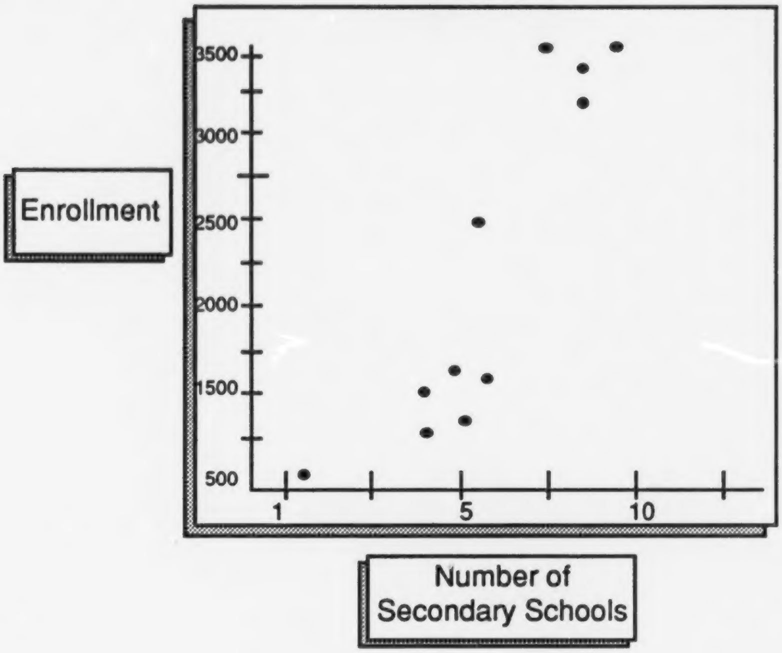
Primary School Data By District

District	Avg. Age	% Pass	# of Schools	Enrollment	% Drop	Income
1	12.0	25	2	500	75	300
2	11.4	35	6	1,600	20	2,700
3	11.8	45	5	1,100	22	3,000
4	12.4	35	10	3,500	30	2,100
5	12.0	55	8	3,500	50	1,800
6	11.0	55	9	3,000	60	600
7	11.0	75	7	1,500	65	90
8	11.8	65	4	1,500	40	1,500
9	12.8	65	7	2,500	55	1,200
10	13.0	45	9	3,300	40	1,900
11	12.0	67	4	1,000	35	2,400

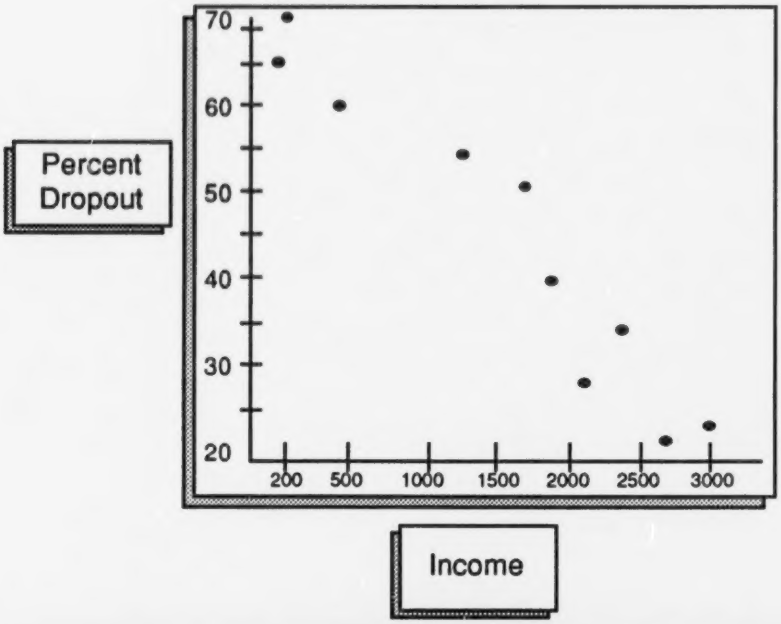
Scatterplot 1



Scatterplot 2



Scatterplot 3



TASK

Task

- Continuing with the Case Study, using data from the following table, draw a scatterplot of the relationship between the percent certified teachers by district against the average total score on the teacher competency test in each district. What can you tell from this scatterplot? Write a statement describing the apparent relationship between teacher certification and test scores.

- Next draw two similar scatterplots, but break the teacher competency test score down by its two components: classroom practices and professional knowledge. What can you tell from these scatterplots? How do they differ from the previous scatterplot? Write a statement detailing the apparent relationship between teacher certification and the two sections of the teacher competency examination.

Teacher Competency Exam Scores

	Percent Certified	Professional Knowledge*	Classroom Performance*	Total Score*
Districts				
Central	71	14	22	36
Ghanzi	70	13	25	38
Kgalagadi	65	12	21	33
Kgatleng	68	14	24	38
Kweneng	69	13	25	38
North East	62	10	22	32
North West	65	13	24	37
South East	85	16	21	37
Southern	68	13	23	36
Towns				
Francistown	86	16	36	52
Lobatse	84	17	35	52
Selebi-Phikwe	78	15	37	52
Gaborone	68	14	36	50

* Maximum scores are: 25 points for Professional Knowledge
40 points for Classroom Performance
65 points Total Examination

OBJECTIVE 3.4

Spurious Correlations

Spurious Correlations

Explanatory Text

Explanatory Text

We mentioned before that an observed correlation between two variables does not necessarily imply that one factor caused the other. Similarly, when one observes no relationship between two variables, it may be the case that the two are actually related, but that something else has not been taken into account in the analysis. There are numerous ways to bring other factors into an analysis in order to help understand the relationship between variables. One straightforward method is to split the data up according to a third category which may be affecting a relationship, and then to draw separate scatterplots for the data in each category.

TASK

Task

Using the same data as in the previous exercise, split the data up by districts versus towns. Now draw two scatterplots (use the grid sheet on the next page) showing the relationship between percent certified teachers and total competency test scores, one for towns and the other for districts. How has this affected the apparent relationship? What might account for this change?

Write a statement describing the relationship between teacher certification and competency test scores in districts versus towns. Include a sentence in your analysis on the differences in the two relationships.

Teacher Competency Exam Scores

	% Certified	Professional Knowledge	Classroom Performance	Total Score
Districts				
Central	71	14	22	36
Ghanzi	70	13	25	38
Kgalagadi	65	12	21	3
Kgatleng	68	14	24	38
Kweneng	69	13	25	38
North East	62	10	22	32
North West	65	13	24	37
South East	85	16	21	37
Southern	68	13	23	36
Towns				
Francistown	86	16	36	52
Lobatse	84	17	35	52
Selebi-Phikwe	78	15	37	52
Gaborone	68	14	36	50

* Maximum scores are:
25 points for Professional Knowledge
40 points for Classroom Performance
65 points Total Examination

4

RESTATE THE PROBLEM

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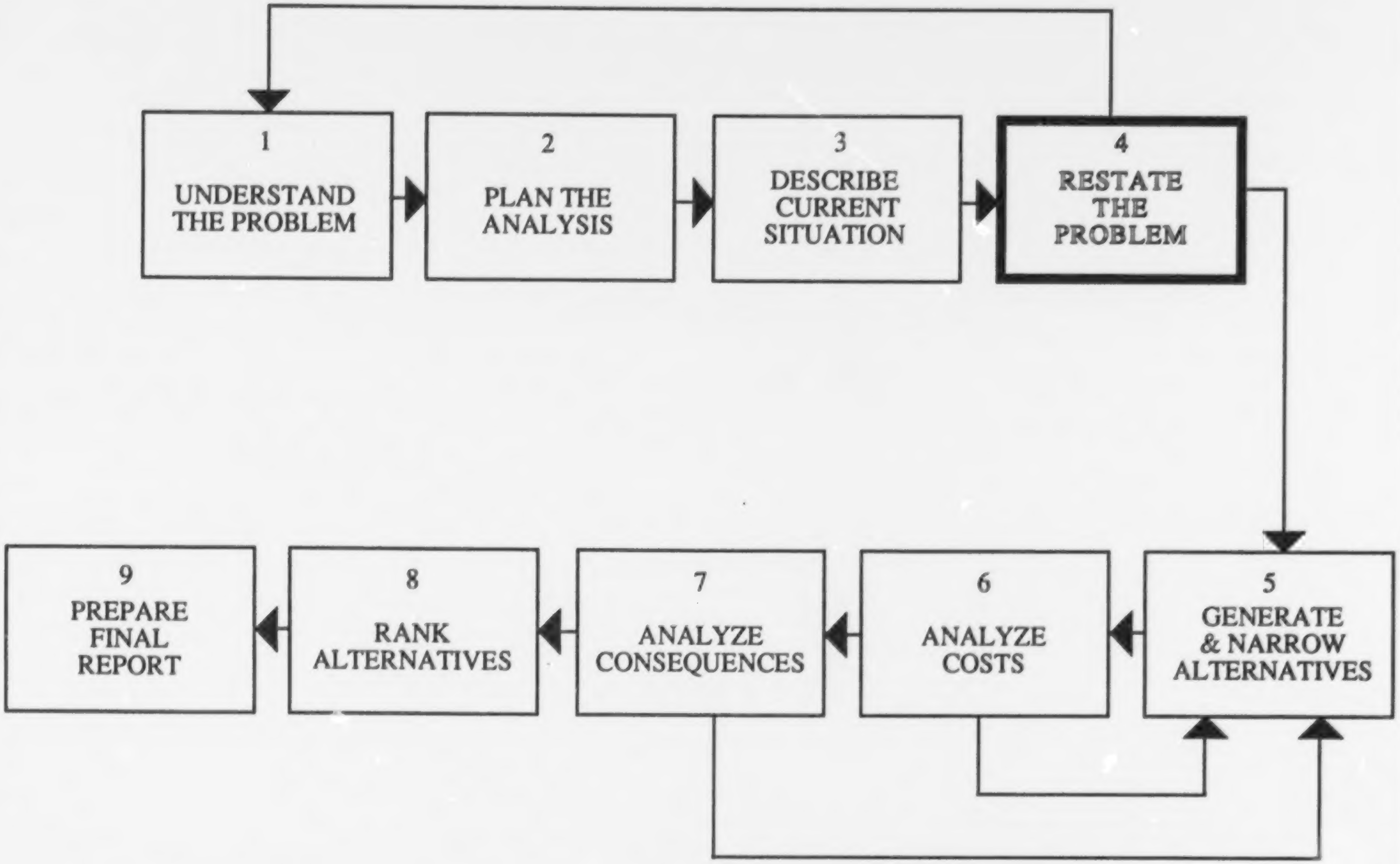


1 UNDERSTAND THE PROBLEM

2 PLAN THE ANALYSIS

3 DESCRIBE CURRENT SITUATION

4 RESTATE THE PROBLEM

5 GENERATE & NARROW ALTERNATIVES

6 ANALYZE COSTS

7 ANALYZE CONSEQUENCES

8 RANK ALTERNATIVES

9 PREPARE FINAL REPORT

STEP 4
RESTATE THE PROBLEM

OBJECTIVE 4.1

Visually Present Data in Order to Make Statistics Clear to the Reader

OBJECTIVE 4.2

Techniques of Statistical Projection

OBJECTIVE 4.3

Specify Goals or Targets

OBJECTIVE 4.1

TO VISUALLY PRESENT DATA IN ORDER TO MAKE STATISTICS CLEAR TO THE READER

To Visually Present Data in Order to Make Statistics Clear to the Reader

Explanatory Text

Explanatory Text

Data become more meaningful and useful when the decision-maker working with such data is able to readily understand the information it contains. Graphic presentation of statistical data is almost always more understandable and eye-catching than data presented in tabular form.

Three of the most common forms of graphs include:

a) the pie chart
b) the line chart
c) the bar chart (or histogram).

The Pie Chart is a graph used to portray parts of the total. The whole circle represents the total, and the sectors of the circle (or slices of the pie) are proportional to their relative amount of the total. To draw a pie chart by hand, follow these steps:

a) Compute the percentage of the whole for each component.

b) Multiply 360 (the whole area of the circle) by each percentage.

c) Draw the circle, using a compass or template.

d) Divide the circle into sectors of the proper sizes, using a protractor.

e) Label the chart, using colors or graphic marks.

Example

Example

Here is how a pie chart would be drawn which graphically shows the breakdown of men and women in districts and towns in the teaching force:

SEX OF TEACHERS BY TOWNS AND DISTRICTS

	Towns	Districts
Females	total=695	total=4106
Males	total=100	total=1397

		% of total	x 360
Women in towns	695	11	40
Women in districts	4106	65	235
Men in towns	100	2	6
Men in districts	1397	22	80

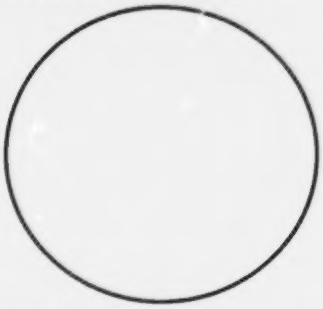
[Draw Pie Chart on this page.]

Task 1

TASK 1

Continuing with the Case Study example, draw a simple pie chart showing the composition of the teaching force broken down by certified versus uncertified teachers.

		% of total	x 360
Number of certified teachers	4404		
Number of uncertified teachers	1894		



The Line Chart is particularly useful in portraying data over time. Trends and patterns are easier seen graphically than in tables of numbers. The line chart is drawn using the following steps:

a) Using graph paper, first place the years included in the table along the x-axis (the horizontal).

b) Determine the highest data point to be plotted and divide the y- axis (the vertical) in convenient units to accommodate the highest point.

c) Plot each year's data at the proper intersection.

d) Connect the points with straight lines.

e) Finally, label the axes.

Example

Example

Here is a line chart showing the growth in the number of primary schools over a five-year period:

Year	# of Primary Schools
1979	355
1980	377
1981	401
1982	464
1983	489

[Draw line graph here.]

TASK 2

Task 2

Using the following data, draw two line graphs:

a) plot the number of certified teachers over the period 1979 - 1983.

b) plot the percentage of certified teachers over the same time period.

Year	Cert. Primary Teachers	% Certified
1979	3456	62
1980	3544	63
1981	3698	64
1982	4012	67
1983	4404	70

Use graph paper on next page.

Bar Charts (or Histograms) may be used to present the relative frequency, or quantities, of a category of interest to policy analysts. One may wish to show the primary school enrollments in the various districts in a country, for example, or the distribution of grades on a national exam. To draw a bar chart, use the following steps:

a) Lay out the range of values to be plotted along the x-axis (the horizontal) on a sheet of graph paper.

b) Determine the highest frequency to be plotted and divide the y-axis (the vertical) in convenient units to accommodate the highest point.

c) Plot the point over each value corresponding to its frequency.

d) Draw a bar (a rectangle) about the points.

e) Finally, label the chart.

Example

Example

Here is an example of a bar chart showing the grades received by students on the primary school leaving examination:

Grade Received	Number of Students
A	1,419
B	8,427
C	10,443
D	7,437

[Draw bar graph here]

TASK 3

Using data from the following table, draw a bar graph showing the percentages of certified versus uncertified teachers over the period 1979 - 1983.

Year	% Uncertified	% Certified
1979	38	62
1980	37	63
1981	36	64
1982	33	67
1983	30	70

OBJECTIVE 4.2

Techniques of Statistical Projection

Explanatory Text

TECHNIQUES OF STATISTICAL PROJECTION

Explanatory Text

Making projections is an integral aspect of the decision-making process. The most important concept in understanding this topic is that all projections must be based on assumptions. As we change our assumptions, so do our projections change.

The linear trend line is the simplest projection procedure. It assumes that growth rates remain constant, and that no external factors will change or interfere with the simple projection. To use this technique manually, follow these steps:

a) Draw a scatterplot with the years along the x-axis (the horizontal) and the variable of interest along the y-axis (vertical).

b) Using a ruler, draw the straight line that best fits between the plotted points, continuing the straight line into the future on the graph.

c) Then, simply read the points at which the line intersects the years in the future you wish to project.

Example

Example

Using the data on the numbers of primary schools with which we drew the line graph example, we will project the number of primary schools which will exist in 1989, assuming that building continues as it has over the last five years.

Year	# of Primary Schools
1979	355
1980	377
1981	401
1982	464
1983	489

[Draw linear projection here.]

The predicted number of schools in 1989 is 000.

TASK 1

Using a linear trend line, predict the percentage of trained teachers who will be in the system in 1989, using data from the following table.

Year	% Certified
1979	62
1980	63
1981	64
1982	67
1983	70

Projections are often based not on the assumption of linear growth, but rather on assumptions concerning growth rates. These may be computed by hand when only a few factors are taken into account. Otherwise, complex computer programming must be used.

Example

Example

Recalling the example used previously concerning the number of school buildings, let us show how the projection will be affected by several facts and assumptions:

a) There are currently 489 primary schools

b) There are currently 194,897 students enrolled in primary schools (in 1983).

c) This represents an average of about 400 students per primary school.

d) There are about 210,000 children in the primary population. Thus, the current enrollment ratio (of the primary school age population) is 92%

e) The government is predicting that the enrollment ratio will be 99% in 1993.

f) The population is growing at 2.5% per year.

g) Assuming that enough schools will be built to keep the number of students at 400 per school, how many schools will be needed in 1993?

Here is how we will go about making this projection:

a) How many children do we predict will be in the primary school age population in 1993? We determine this by adding 2.5% per year to the current school age population. It is easiest to do this by multiplying the population by 1.025 to arrive at the prediction for the next year:

1983	210,000	x 1.025 =
1984	215,250	x 1.025 =
1985	220,631	x 1.025 =
1986	226,147	x 1.025 =
1987	231,801	x 1.025 =
1988	237,596	x 1.025 =
1989	243,536	x 1.025 =
1990	249,624	x 1.025 =
1991	255,865	x 1.025 =
1992	262,261	x 1.025 =
1993	**268,818**	

b) Now that we have predicted the school age population for 1993, we take the assumption of 99% enrollment to predict the number of primary school students in 1993:

268,818 x .99 = **266,130**

c) Finally, given the assumption that enough schools will be built to keep the capacity at about 400 students per school, we divide the predicted number of students (266,130) by 400 to arrive at the predicted number of schools in 1993.

266130 / 400 = **665**

Predict the percentage of primary school teachers who will be certified in 1989, using the following facts and assumptions:

a) There are currently 194,897 students in primary schools. (We are currently in the year 1983.)

b) This represents an enrollment rate of 92%.

c) The school age population is 210,000.

d) The school age population is projected to grow at 3% per year.

e) The enrollment rate is expected to grow to 98%.

f) There are currently 4404 certified teachers in the system, and 1894 uncertified teachers.

g) It is predicted that 100 uncertified teachers will leave the system each year to attend Teacher Training Colleges.

h) It is predicted that 120 certified teachers per year will resign for other jobs or retire.

i) The current capacity of the three Teacher Training Colleges is 900 students in the two-year certification program.

j) The estimated output of the three Teacher Training Colleges is 440 newly certified teachers per year, all of whom will go into teaching.

k) Assume that enough teachers will enter the system so that the current student-teacher ratio will remain the same.

Write a summary of your projection, which includes the assumptions made to arrive at the projections.

Specifying Goals or Targets

SPECIFYING GOALS OR TARGETS

Explanatory Text

Explanatory Text

The final step in restating the problem is to specify concrete goals or targets to be reached by the policy initiative. This requires that the objectives of policy be expressed in terms of criteria that are useful for operational purposes, i.e. that are either measurable or about which informed qualitative judgments can be made. However, even though the criteria must be operational, these specific goals are almost always arrived at through a complex process involving professional judgment, analysis of political realities, and trial and error, to name a few factors. That is to say, the actual concrete goals of a policy are typically the result of much debate, advocacy, and compromise.

Example

Example

Many countries have implemented universal literacy programs, ones which are, in the general sense, supposed to have as their goals that "everyone in the nation becomes literate." However, the operational goals are usually less sweeping, but rather are rooted in the political, social, and economic realities of the particular national context. Factors which need to be taken into account in specifying operational goals for a "universal literacy" program might include:

a) The operational definition of literacy, e.g., scoring sixty-five percent on a particular reading examination.

b) An estimate of the percent of the population who are currently literate, according to that definition.

c) The capacity of primary schools.

d) The current status of adult education programs.

e) Linguistic and cultural differences between national groups.

f) Projected resources available.

g) The breadth of political support for the program.

h) What would happen if no program were instituted.

Given such constraints, an operational goal for such a "universal literacy program" might be:

That 90% of the urban and 80% of the rural persons over 10 years of age be able to pass the Functional Literacy Examination at a level of 65 percent or higher.

Task

TASK

Returning to the Case Study, specify concrete targets for the policy on improving teacher quality, using techniques of group consensus.

You should take into consideration the information from the previous step, especially the capacity of teacher training colleges and the projections already made. You may also find the data on the next page useful:

- A comparison of certification levels in similar countries;
- A comparison of scores on the teacher competency examination in similar countries;
- Budgetary data (remember the 20% budget increase limitation).

Write a statement specifying your goals and targets, including justification.

PERCENT OF ALL PRIMARY TEACHERS WITH TEACHER TRAINING COLLEGE CERTIFICATION
COUNTRY COMPARISONS

Country	Percent Certified
Country A	91.4
Country B	93.3
Country C	90.0
Country D	88.6
Our Country	**69.9**
Country F	89.6
Country G	91.3
Country H	86.0
Country I	88.9
Country J	85.9
Country K	69.5

REPORT OF MEAN SCORES ON TEACHER COMPETENCY EXAMINATION
COUNTRY COMPARISONS

Country	Professional Knowledge	Classroom Performance	Total Score
Country A	19.2	33.5	52.7
Country B	20.0	34.3	54.3
Country C	18.5	32.5	51.0
Country D	21.1	35.5	56.6
Our Country	**13.8**	**27.0**	**40.8**
Country F	19.0	34.2	53.2
Country G	16.4	30.1	46.5
Country H	17.0	29.5	46.5
Country I	15.5	30.2	45.7
Country J	14.5	29.3	43.8
Country K	12.6	25.3	37.9

* Maximum scores are:
25 points for Professional Knowledge
40 points for Classroom Performance
65 points Total Examination

Source: World Educational Testing Service Report, 1983.

MINISTRY OF EDUCATION RECURRENT EXPENDITURE BUDGET
1982-83/1983-84
(Current Price, Thousand Pula)

Activity/Department	1982-1983 (Authorized)		1983-1984 (Estimated)	
	Amount	Percent	Amount	Percent
Headquarters	6,238.0	12.3%	5,913.0	10.8%
Department of Technical Education	2,177.6	4.3	2,351.1	4.3
Bursaries	5,011.1	9.9	6,469.3	11.8
Department of Non-Formal Education	590.9	1.2	658.6	1.2
Department of Curriculum, Development & Evaluation	752.4	1.5	825.2	1.5
Department of the Unified Teaching Service	28,769.6	56.9	30,646.1	56.0
Department of Primary Education	575.6	1.1	692.0	1.3
Department of Secondary Education	5,539.3	11.0	6,182.9	11.3
Department of Teacher Training	926.6	1.8	1,001.9	1.8
Total	50,580.9	100.0	54,740.0	100.0

Source: Financial Statements, Tables and Estimates of Consolidated and Development Fund Revenues, 1983-1984.

5

GENERATE & NARROW ALTERNATIVES

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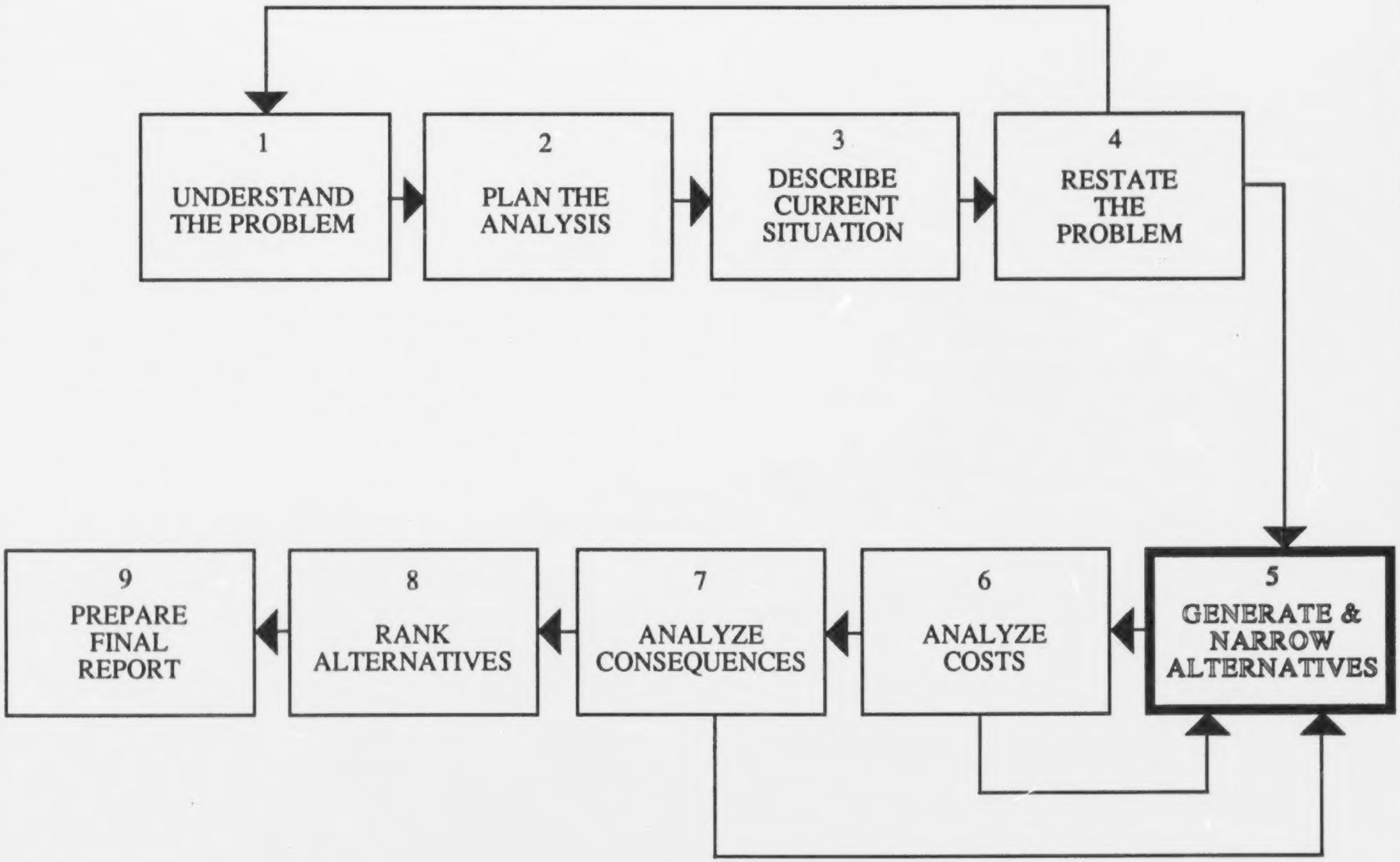

1 UNDERSTAND THE PROBLEM

2 PLAN THE ANALYSIS

3 DESCRIBE CURRENT SITUATION

4 RESTATE THE PROBLEM

5 **GENERATE & NARROW ALTERNATIVES**

6 ANALYZE COSTS

7 ANALYZE CONSEQUENCES

8 RANK ALTERNATIVES

9 PREPARE FINAL REPORT

STEP 5
GENERATE AND NARROW ALTERNATIVES

OBJECTIVE 5.1

List Alternative Solutions

OBJECTIVE 5.2

Eliminate Non-feasible Alternatives

OBJECTIVE 5.3

Compare Obvious Implications of Solutions with Obvious Constraints

OBJECTIVE 5.4

Make Retained Solutions Concrete

OBJECTIVE 5.1

LIST ALTERNATIVE SOLUTIONS

List Alternative Solutions

Explanatory Text

Explanatory Text

Once a problem has been identified, and goals have been specified, an analyst must identify possible alternative policy solutions to achieve those goals. Few problems have a single solution, and there is no guarantee that the first solution that occurs to the analyst will be the best.

Creative solutions to policy problems often arise out of the group context. A good way to enumerate as many solutions as possible is to use brainstorming techniques. Remember that one rule during brainstorming sessions is not to eliminate any suggestion, no matter how outlandish it may first appear.

Example

Example

Using group brainstorming techniques, a group might come up with a list like the following which addresses the policy issue of how to increase the literacy rate:

- build new schools
- eliminate other coursework
- ~~provide monetary rewards~~
- ~~parachute reading primers into rural areas~~
- literacy brigades
- radio learning
- have older kids teach younger kids
- ~~execute non-readers~~
- change the definition of literacy
- ~~import citizens from other countries~~
- train new teachers to improve student-teacher ratio
- ~~give coaching for the examinations~~

After brainstorming, some ideas may be eliminated.

TASK

Task

Using group brainstorming techniques, generate a list of at least 15 solutions to the Case Study problem of how to improve teacher quality, according to the operational definition specified in the previous step.

Eliminate Non-Feasible Alternatives

OBJECTIVE 5.2

ELIMINATE NON-FEASIBLE ALTERNATIVES

Explanatory Text

Explanatory Text

A possible solution is of no value if it is non-feasible, in other words if it could not in fact be applied. Many factors can make a possible solution non-feasible: it may require unreasonable amounts of resources, it may be politically or socially unacceptable, it may be administratively not possible, it may assume or require changes elsewhere that are unlikely, it may simply be inappropriate to the context of the problem, or it might be plain outlandish.

The first stage of screening for non-feasibility is to simply make the judgment: is this solution feasible or non-feasible? This is quickly done using group consensus techniques.

Example

Example

From the list of policies to increase the literacy rate which was generated in the example above, a group might have eliminated the crossed-out solutions as non-feasible:

- build new schools
- eliminate other coursework
- provide monetary rewards
- parachute reading primers into rural areas
- literacy brigades
- radio learning
- have older kids teach younger kids
- execute non-readers
- change the definition of literacy
- import citizens from other countries
- train new teachers to improve student-teacher ratio
- give coaching for the examinations

Task

TASK

Using the list of 15 solutions to the teacher quality problem developed in the step above, eliminate the alternatives which are obviously non-feasible. Use group consensus techniques.

OBJECTIVE 5.3

Compare Obvious Implications of Solutions With Obvious Constraints

COMPARE OBVIOUS IMPLICATIONS OF SOLUTIONS WITH OBVIOUS CONSTRAINTS

Explanatory Text

Explanatory Text

Having eliminated those possible alternative solutions that are obviously non-feasible, there will often remain many alternatives. Since only a few policy options can be explored in sufficient depth, the remaining options will have to be examined a little more carefully, in order to further shorten the list.

The first step is to identify the constraints that obviously limit possible solutions. It may often be helpful to organize constraints under various categories, such as economic, social, cultural, administrative, political, technical, etc.

Where alternative solutions still appear possible, one can screen out more non-feasible alternatives by quickly comparing the obvious implications of each in a number of areas with the obvious or implicit constraints in each of those areas.

Example

Example

From the list of policies to increase the literacy rate which was generated in the example above, a group might have eliminated the crossed-out solutions as non-feasible:

- build new schools
- ~~eliminate other coursework~~ (resistance from teachers)
- literacy brigades
- ~~radio learning~~ (too costly)
- have older kids teach younger kids
- ~~change the definition of literacy~~ (too political)
- ~~train new teachers~~ (takes too long)

TASK

Task

Using the remaining list of solutions to the teacher quality problem developed in the step above, compare the implications with the constraints. Use group consensus techniques to arrive at two or three remaining solutions.

OBJECTIVE 5.4

Making Retained Solutions Concrete
Explanatory Text

MAKING RETAINED SOLUTIONS CONCRETE

Explanatory Text

A vague and abstract solution does not provide sufficient guidance for beginning to consider policy implementation issues. Solutions must be converted into concrete plans of action, including such factors as program location, extent of implementation, personnel involved, specific target population, etc. At this stage, non-feasibility may again become evident, and it may be necessary to revert to thinking of new alternative solutions.

Example

Example

From the list of policies to increase the literacy rate which was generated in the example above, a group might have made one of the retained solutions more concrete in the following way:

Solution: Have older children teach younger children

a) Commission a research specialist from the Ministry of Education Research Division to do a study on peer-teaching programs which have been implemented in other countries.
b) Develop a curriculum which trains students in the last year of primary school in the techniques of literacy instruction.
c) Develop an administrative strategy to release these students from one period of coursework in order to undergo this training program.
d) Develop a testing strategy to identify non-readers in the third year and above of primary school.
e) Develop an administrative strategy to have the trained peer teachers instruct the identified non-readers for two class periods per day.
f) Organize a conference for school administrators to disseminate these ideas and receive their feedback.
g) Decide on a timeline for these steps.
h) Decide on a program evaluation strategy.

Task

TASK

Make the solutions you retained for the teacher quality problem concrete. Write a series of specifications for each solution.

6

ANALYZE COSTS

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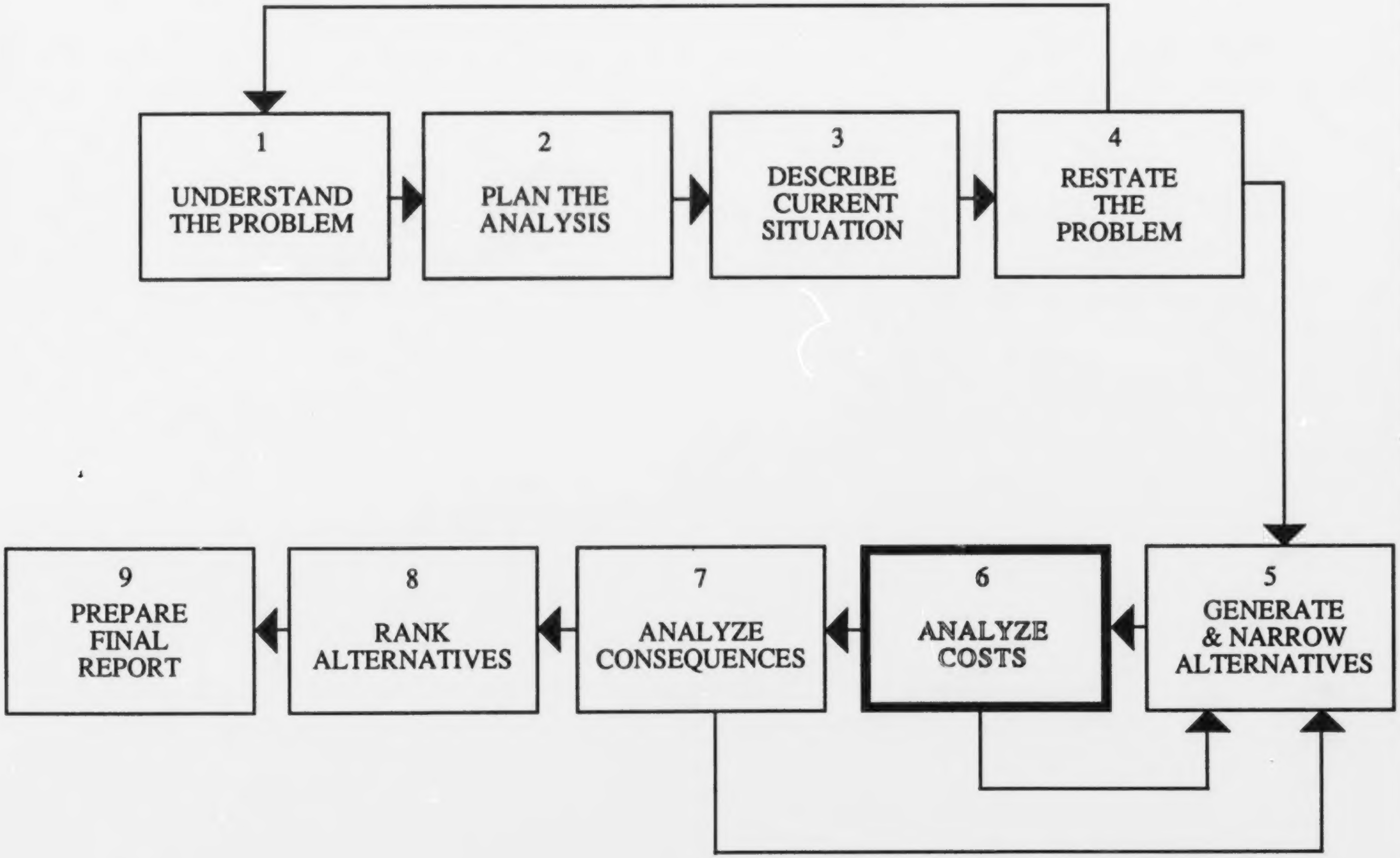

1
UNDERSTAND THE PROBLEM

2
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4
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6
ANALYZE COSTS

7
ANALYZE CONSEQUENCES

8
RANK ALTERNATIVES

9
PREPARE FINAL REPORT

STEP 6

ANALYZE ALL COSTS

OBJECTIVE 6.1

Understand Cost Concepts

OBJECTIVE 6.2

Understand Recurrent and Non-recurrent Costs

OBJECTIVE 6.3

Understand Direct and Indirect Costs

OBJECTIVE 6.4

Understand Monetary and Non-monetary Costs

OBJECTIVE 6.5

Make Financial Projections

OBJECTIVE 6.6

Understand Unit Costs

UNDERSTANDING COST CONCEPTS

Explanatory Text

The concept of cost, when used by economists, is broader than its simple meaning in everyday discussion, "What does something cost in terms of money?"

We live in a world of scarcity. When an action is taken, or a decision is made, there is a cost: something is given up. Often many things are given up, not only things measurable in money. What is given up is the alternatives -- what could have happened if we had done something, or decided something, different. Usually the many alternatives are mutually exclusive -- i.e. we could not have had all of them, only one. The one that would have been best, most highly valued, from the point of view from which we are looking at the decision or action is the cost of that decision or action.

For example, if the decision is made to hire extra teachers in order to avoid an increase in the pupil-teacher ratio as a result of increasing enrollments, one measure of the cost of that decision would be the annual salaries needed to employ those additional teachers. However, if on the other hand it was decided not to hire extra teachers, but to use available funds to increase the availability in schools of books and other materials, one could say that the cost of the books and materials was the increase in the pupil-teacher ratio.

Immediately the usefulness of money measures becomes apparent: money serves as a common denominator, a simple summary measure which expresses in one figure all the alternatives that could have been done which would have had the same money cost.

Many actions or decisions, however, have important consequences or costs which cannot be expressed in terms of money, or money alone. For example, a decision to change the transition rate from primary to secondary school from say 25% to 30% will not only have budgetary costs for the school system, but will have implications for successful and unsuccessful pupils and their families, for teachers (whose class sizes may increase), and for other students already in secondary schools. Some of these cost consequences are economic, some are both economic and involve actual money expenditures, and others are not easily seen as economic but nevertheless may be important (if, for example, pupil- teacher ratios in upper secondary classes increase because of a reallocation of teachers and this has an effect on pupil performance).

Costs of policy actions are not only borne by government, of course, but government actions also frequently impose costs on households or businesses. Increased taxes are an obvious example, but there may be less obvious costs to groups and individuals which are not directly financial, which are the result of government actions -- and these costs may be important to take into account when considering a policy proposal. For example, increasing the number of students in secondary school removes those children from the workforce, costing the family unit the salary which he or she might have earned and contributed to the household.

Note also that it is often impossible to identify and describe in detail the cost implications of a proposal until and unless the proposal itself has been fully specified in detail-- otherwise it will be necessary to make assumptions about the particulars about the implementation of the proposal.

Example

Example

Continuing with the example of the program to increase the literacy by using older children to teach younger children, here is a partial list of the groups who are likely to bear costs of this program, and the nature of those costs.

Costs borne by the government:

- Salary of the research specialist who writes the report on peer teaching programs
- Cost of producing the report
- Salaries of consultants who produce the reading curriculum
- Cost of producing textbooks
- Salaries of administration experts who produce the strategy for scheduling the peer teaching
- Salaries of regional teacher-supervisors who assist in training peer teachers and monitoring
- Cost of testing the primary students for reading level
- Cost of holding conference for school administrators
- Possible political cost to government if teachers union objects to infringement on their professional activities
- Possible political cost to government of having more qualified primary students applying to limited places in secondary schools (if the program works)

Costs borne by students:

- Time lost by peer teachers (older students) in training, which could have been spent on other coursework or productive activity
- Time lost by older students teaching younger ones, when they would have been taking other courses
- Greater competition for admission to secondary school as a result of more literate students competing for limited spaces
- Possibly lower quality of instruction for younger students than they would have had from certified and experienced teachers

Task

TASK

Continuing with the Case Study, identify the costs associated with each of the proposals retained for improving teacher quality. Keep a written record of the costs for each proposal.

OBJECTIVE 6.2

Understanding Recurrent and Non-Recurrent Costs

Explanatory Text

UNDERSTANDING RECURRENT AND NON-RECURRENT COSTS

Explanatory Text

Some costs, be they monetary or non-monetary, may be anticipated to be one-time-only costs, such as the purchase price of a vehicle, the cost of constructing a school building, or the cost of producing a curriculum. These costs are called non-recurrent, since they are incurred only once.

Other costs, those classified as recurrent costs, are those that can be expected to continue year by year. These might include the price of gasoline for a vehicle, anticipated maintenance of the vehicle, the maintenance of a school building, the salaries of teachers in a school, or the cost of periodically printing books to replace those which inevitably become worn and unusable.

A related and important issue is the notion of the irrelevance of sunk costs, namely that from the point of view of what to do now or in the future, the resources that have been expended in the past are, strictly speaking, irrelevant. What matters is what it will cost now and in the future to achieve one's objective, not what one may have spent in the past.

For example, if a badly constructed building collapses, and the accommodation is needed, the relevant question is how much it would cost to fix the old building compared to building a new one. Whether one had previously spent 50,000 CFAF or 5,000,000 CFAF on the old one is irrelevant to the decision of whether it is better to repair the old or build a new.

Example

Example

Taking the list of costs of instituting the peer teaching literacy program, here is how they would be classified as recurrent or non- recurrent.

Costs borne by the government:

non-recurrent-	Salary of the research specialist who writes the report on peer teaching programs
non-recurrent-	Cost of producing the report
non-recurrent-	Salaries of consultants who produce the reading curriculum
recurrent -	Cost of producing textbooks
non-recurrent-	Salaries of administration experts who produce the strategy for scheduling the peer teaching
recurrent -	Salaries of regional teacher-supervisors who assist in training peer teachers and monitoring
recurrent -	Cost of testing the primary students for reading level
non-recurrent-	Cost of holding conference for school administrators
recurrent -	Possible political cost to government if teachers union objects to infringement on their professional activities
recurrent -	Possible political cost to government of having more qualified primary students applying to limited places in secondary schools (if the program works)

Costs borne by students:

recurrent - Time lost by peer teachers (older students) in training, which could have been spent on other coursework or productive activity
recurrent - Time lost by older students teaching younger ones, when they would have been taking other courses
recurrent - Greater competition for admission to secondary school as a result of more literate students competing for limited spaces
recurrent - Possibly lower quality of instruction for younger students than they would have had from certified and experienced teachers

Task

TASK

Continuing with the Case Study, take the list of costs associated with each of the proposals retained for improving teacher quality, which you generated in the previous step, and classify each as recurrent or non-recurrent.

OBJECTIVE 6.3

Understanding Direct and Indirect Costs.

UNDERSTANDING DIRECT AND INDIRECT COSTS.

Explanatory Text

Cost is originally an economic concept, and it is often related to the notion of output or objectives. We want to do something because we want to achieve something, some objective, which at least sometimes we can express in quantitative terms as an output, e.g., we want to increase school enrollment by 10% in a particular region.

Often, the costs of achieving an objective that can be quantified in this way can be divided into the two categories direct and indirect. The direct costs are those that can be directly associated with the production of particular units of the output or objective, e.g., each class requires a teacher. The indirect costs are those that are not directly associated with particular units of the output or objective, but which are nevertheless necessary and may vary to some extent with the volume of the output, for example, administrative costs, maintenance of buildings, or travel costs of the inspectorate.

Often the division is somewhat arbitrary depending on the level at which the unit of output is defined and the particular assumptions that are made, but the notion remains useful since indirect costs are often overlooked if they are not sought in a specific category of their own.

Example

Example

Taking the list of costs of instituting the peer teaching literacy program, here is how they might be classified as direct or indirect.

Costs borne-by the government:

direct -	Salary of the research specialist who writes the report on peer teaching programs
direct -	Cost of producing the report
direct -	Salaries of consultants who produce the reading curriculum
direct -	Cost of producing textbooks
indirect -	Salaries of administration experts who produce the strategy for scheduling the peer teaching
direct -	Salaries of regional teacher-supervisors who assist in training peer teachers and monitoring
direct -	Cost of testing the primary students for reading level
direct -	Cost of holding conference for school administrators
indirect -	Possible political cost to government if teachers union objects to infringement on their professional activities
indirect -	Possible political cost to government of having more qualified primary students applying to limited places in secondary schools (if the program works)

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Costs borne by students:

indirect -	Time lost by peer teachers (older students) in training, which could have been spent on other coursework or productive activity
indirect -	Time lost by older students teaching younger ones, when they would have been taking other courses
indirect -	Greater competition for admission to secondary school as a result of more literate students competing for limited spaces
indirect -	Possibly lower quality of instruction for younger students than they would have had from certified and experienced teachers

Task

TASK

Continuing with the Case Study, take the list of costs associated with each of the proposals retained for improving teacher quality, and classify each as direct or indirect.

OBJECTIVE 6.4

Understanding Monetary and Non-monetary Costs.
Explanatory Text

Understanding Monetary and Non-monetary Costs

Explanatory Text

The final distinction we will discuss related to kinds of costs is between those which can be quantified in terms of money, and those which cannot. Again, this distinction is not always so clear as it may sound, as many costs which at first appear not to have a monetary price may actually be able to have price estimates attached to them, based on making a few assumptions.

In the peer teaching example, it is clear that one could attach a monetary cost to developing the curriculum, or running a conference. On the other hand, it is difficult to envision a realistic price being assigned to the cost borne by the government as a result of teacher union objections to the infringement of their professional activities.

In between these extremes, one could say that there is not an obvious monetary price which can be placed on the time lost by older students in coursework they might have taken instead of teaching younger students. However, if it could be demonstrated that these students would have taken a certain course which would have led to their greater productivity in agriculture, for example, then the possibility exists that their lost productivity could have a price attached to it. Of course, many assumptions would have to be made to compute such an estimate.

Example

Example

Taking the list of costs of instituting the peer teaching literacy program, here is how they might be classified as monetary or non- monetary.

Costs borne by the government:

monetary - Salary of the research specialist who writes the report on peer teaching programs
monetary - Cost of producing the report
monetary - Salaries of consultants who produce the reading curriculum
monetary - Cost of producing textbooks
monetary - Salaries of administration experts who produce the strategy for scheduling the peer teaching
monetary - Salaries of regional teacher-supervisors who assist in training peer teachers and monitoring
monetary - Cost of testing the primary students for reading level
monetary - Cost of holding conference for school administrators
non-monetary - Possible political cost to government if teachers union objects to infringement on their professional activities
non-monetary - Possible political cost to government of having more qualified primary students applying to limited places in secondary schools (if the program works)

Costs borne by students:

non-monetary - Time lost by peer teachers (older students) in training, which could have been spent on other coursework or productive activity
non-monetary - Time lost by older students teaching younger ones, when they would have been taking other courses
non-monetary - Greater competition for admission to secondary school as a result of more literate students competing for limited spaces
non-monetary - Possibly lower quality of instruction for younger students than they would have had from certified and experienced teachers

Task

TASK

Continuing with the Case Study, take the list of costs associated with each of the proposals retained for improving teacher quality, and classify each as monetary or non-monetary.

Making Financial Projections

Explanatory Text

Making Financial Projections

Explanatory Text

When deciding between alternative policy proposals, it is essential to provide an estimate of the financial implications of each. In other words, how much monetary expenditure will each alternative under consideration require government to make. As with all projections of the future, the answer one arrives at depends on the assumptions that are made.

Financial projections are easier to make if one separates the recurrent from non-recurrent monetary costs. Since non-recurrent costs are one-time-only expenses, and since they typically occur at the beginning of a project (but not always), their estimation is usually fairly straightforward: What is the cost of holding the initial conference? What is the cost of developing the curriculum?

In general, there are two particular problems when trying to project government spending on particular activities, especially in the recurrent cost category: wage and salary costs; and which costs are likely to change at roughly the same rate as the general price level versus those whose prices will change either faster or slower than the general price level.

Regarding wage and salary costs, the important point is that in many countries the vast majority of government employees, and teachers technically employed by other entities but paid from government funds, are not on fixed rates of pay but on salary scales that involve at least some automatic or semi-automatic incremental increases each year. If total employment stays unchanged, and the age distribution of employees is uniform, such that the number of new hires at the bottom of the scale is equal to the number of retirees at the top of the scale, and everybody else moves up one step, the existence of incremental scales has no effect on total employment costs.

However, that situation is extremely unusual. In many countries, the educational system has been expanding, there are proportionally more teachers at the lower levels of the scale than at the top, so that even if more teachers are not hired the cost of paying teachers tends to rise each year as most teachers get an increment. However, if the teaching force is expanded, the average salary of a teacher may fall, because new teachers are typically hired at the bottom of the salary scale.

To summarize, in order to project employment costs, one needs to know:

a) How salaries are determined
b) Connections between qualifications and scales and placement on scales
c) Whether scales are incremental, and whether increments are automatic or discretionary, and if discretionary, what actual practice is.
d) The current structure of the labor force, i.e. teachers employed, in terms of their qualifications, age, and experience on the job (and hence where they are on the scales);
e) What should be assumed about wastage, i.e. teachers leaving the profession through retirement, job changes, or whatever.
f) What will happen in terms of numbers and qualifications, i.e. if the teaching force is going to be expanded by so many people, what will be their qualifications?

The other difficult but important part of financial projections is trying to divide categories of expenditure into those whose prices will change at roughly the same rate as the general price level, and those whose prices will change either faster or slower than the general price level. This is difficult to do, but often there are a few assumptions that can be made reasonably safely. For example, teacher salary scales are usually set by government, and very often the analyst will have a fairly good idea what to expect government to do with respect to salary scales vis-a-vis inflation. Secondly, in many countries imported items have different price trends from locally produced goods, and to the extent that some of what government or the schools buy is imported, this should be accounted for. Thirdly, construction costs typically tend to increase over time. Thus, if two schools are planned to be built, one now and one in five years, the second school will probably cost more.

Example

Example

The cost of the peer-teacher literacy program might be projected in the following way:

a) Specify the scope of the program (numbers of students to be targeted, how many years the program will last).

b) Assign price estimates to the non-recurrent monetary costs to the government.

c) Decide whether recurrent costs will remain the same over the life of the program, or will they likely increase or decrease?

d) Project these costs over the life of the program.

Implementation details (partial list):

- 1000 students per year are to be served in 4 separate districts and towns
- The project will last for 3 years
- There will be one supervisor per district

Non-recurrent costs to government

Salary of the research specialist who writes the report on peer teaching programs	$ 2,000
Cost of producing the report	500
Salaries of consultants who produce the reading curriculum	10,000
Salaries of administration experts who produce the strategy for scheduling the peer teaching	2,000
Cost of holding conference for school administrators	2,000
Total non-recurrent costs	**16,500**

Recurrent costs to government

Cost of producing textbooks
- $5/student in first year = $5000 year # 1
- $6/replacing lost and damaged books in 2nd and 3rd year = $3000 year # 2
  = $3000 year # 3

Salaries of regional supervisors who assist in training peer teachers and monitoring
- Average salary of four supervisors in first year is 20,000 = $80,000 year # 1
- Average salary in second year =$24,000 (assuming 5% increase) = 96,000 year # 2
- Average salary in third year = 100,800 year # 3

Cost of testing the primary students for reading level
(at $2 per test for 10,000 students in targeted districts per year)
= 20,000 year # 1
= 20,000 year # 2
= 20,000 year # 3

Total Recurrent Costs = **347,800**

Total Projected Costs = **364,300**

TASK

Task

Continuing with the Case Study, take the list of monetary costs associated with each of the proposals retained for improving teacher quality, which you generated in the previous step, and project the cost of each proposal over its anticipated time period, reporting the recurrent, non-recurrent, and total costs for each.

Use the following data from the Case Study to help in computing these costs, and estimate other costs when data are not available. Keep a detailed record of your computations.

Teacher Salary Scales in 1983

What follows are the salary scales in force in 1983. All figures are in Pula per annum. Headteachers receive supplements which vary with size and type of school. If a scale shows no entries beyond a certain number of years of experience, the last figure shown is the top point of that scale, and no increments are received after that point on the scale has been reached.

Years of experience	Untrained Primary	Trained Primary	Untrained Secondary	Trained Secondary
0	2000	3600	4412	7200
1	2048	3696	4520	7356
2	2096	3792	4628	7512
3	2144	3888	4736	7668
4	2192	3984	4844	7824
5		4080		7980
6		4176		8136
7		4272		8292
8		4368		8448
9		4464		8604
10		4560		8760
11		4656		8916
12		4752		

Actual average annual employment costs for each category of teacher in 1983 were:

2096	4066	4632	7692

Education officers, inspectors of education, and lecturers in teacher training colleges are paid on one of three scales, known as A, B, and C. A corresponds to lecturers, education officers, and inspectors; B to senior lecturers, senior education officers, and senior inspectors; and C to principal lecturers, chief education officers, and chief inspectors. The three scales are, in Pula per year, in 1983:

Years of experience	A	B	C
0	8604	9756	12144
1	8796	10068	12624
2	8988	10380	13104
3	9180	10692	13584
4	9372	11004	14064
5	9564		
6	9756		
7	9948		

The average annual employment cost of all teacher training college academic staff in 1983 was 10,142 Pula.

Some Additional Cost Data for 1983.

A report prepared by a consultant has estimated that the costs of training one student per year at various levels of education in 1983 were as follows (each in Pula per year):

Primary	133
Secondary	488
Technical	2623
Nonformal	21
Teacher Training Colleges	608
University	6706

Cost Elements in Inservice Training

Typical arrangements involve the following elements of cost, in addition to the personnel costs of trainees and instructors (which are often not explicit out-of-pocket costs, since lecturers, education officers, and inspectors are sent to do training as part of their normal duties, and teachers receive no additional pay for attendance):

Travel:

All teachers and instructional personnel travelling on Ministry business, e.g. to or from an in-service training course, are either reimbursed actual bus or train fares, or may claim 16 cents (one Pula is 100 cents) per kilometer of the shortest route. Something approaching 98% of teachers claim the 16 cents per kilometer, because it almost always works out to more than the fares (if there is any public transport available).

Meals and accommodation:

Teachers on officially recognized courses are either accommodated at teacher training colleges, education centers, or (during vacations) secondary schools that have boarding facilities. Alternatively, if such accommodation is not possible, they are given cash grants to defray accommodation and meal costs. The cash grants are P5 per diem for meals and P8 per night for accommodation. Costs to government vary; in TTC's about P6 for meals, P7 for room; in Education Centers, P7 for meals, P8 for room; in secondary schools, P4 for meals, P5 for room.

TTC lecturers, education officers, and inspectors get considerably larger allowances when on official travel; these total P15 per diem for meals and P24 per night for accommodation.

Materials costs:

These can vary very substantially with the nature of the particular course, but in general in the past they seem to have averaged about P2.50 per trainee per day, although some externally-funded courses seem to have spent as much as P20 per trainee per day, and some locally funded courses seem to have spent nothing on materials that was recorded, or as little as 15 cents per trainee per day.

MEMORANDUM

TO: Educational Planning Division
FROM: Public Works Division, Building Construction Section
DATE: March 3, 1983
RE: Construction Costs for new Teacher Training College

We have not been able to respond in full detail to your request of February 27 for a precise cost estimate for the construction of a new teacher training college, as we are currently involved in an exhaustive study of the proposed central government office complex, about which we are sure you have heard considerable debate.

However, we located a similar cost estimate which was drawn up in 1981, which should suffice for your immediate purposes. At that time, materials, labor, and other costs were estimated for such a building, but the project never came to fruition. The estimates were as follows:

Estimated costs of materials	55,400 Pula
Estimate costs of labor	14,100
Furnishings	7,000
Miscellaneous	12,700
Total Cost	89,200

You should note that the inflation rate has averaged 15% per year for materials, and 9% per year for labor and other items. You may wish to take these figures into account in projecting an approximate figure for your proposed building.

We are sorry we are not able to provide a more detailed estimate. We'll be glad to work one up when we are out from under the pressure of our current responsibilities.

OBJECTIVE 6.6

Understanding Unit Costs
Explanatory Text

Understanding Unit Costs

Explanatory Text

The notion of unit cost addresses the simple question of "How much does it cost to produce a unit of your desired outcome?" When an output or objective can be expressed in quantitative terms, e.g., number of students trained by peer teachers per year, and the costs associated with that output can also be summarized in money terms, then it is possible to divide the latter by the former and express the unit cost of the activity--in this example, as so many CFAF per student.

For some activities, it may be possible and useful to divide unit costs into various categories, such as recurrent and non-recurrent. For example, each student trained by a peer teacher costs X CFAF per year in recurrent costs (cost of teacher-supervisors, cost of textbooks). In addition, the initial non-recurrent costs of program development, holding conferences, etc., must be divided over the expected life of the program.

In analyzing proposals, it can be very helpful to know what unit costs have been in the past, and then to decide what is the most reasonable assumption to make about the future: will unit costs stay the same, should they reasonably be expected to decline (by how much? at what rate?) or increase?

Example

Example

In the peer-teacher literacy program, the unit costs would be computed in the following way, given the previous projections of recurrent and non-recurrent costs:

The total program will cost 364,300 over 3 years, and will serve a total of 3000 students.

The unit cost, or cost per student is thus:

364,300 / 3,000 = 121.43

TASK

Task

Continuing with the Case Study, take the financial projections of the cost of each proposal, which you completed in the previous step, and compute the unit cost for each proposal. Keep a detailed record of your computations.

7

ANALYZE CONSEQUENCES

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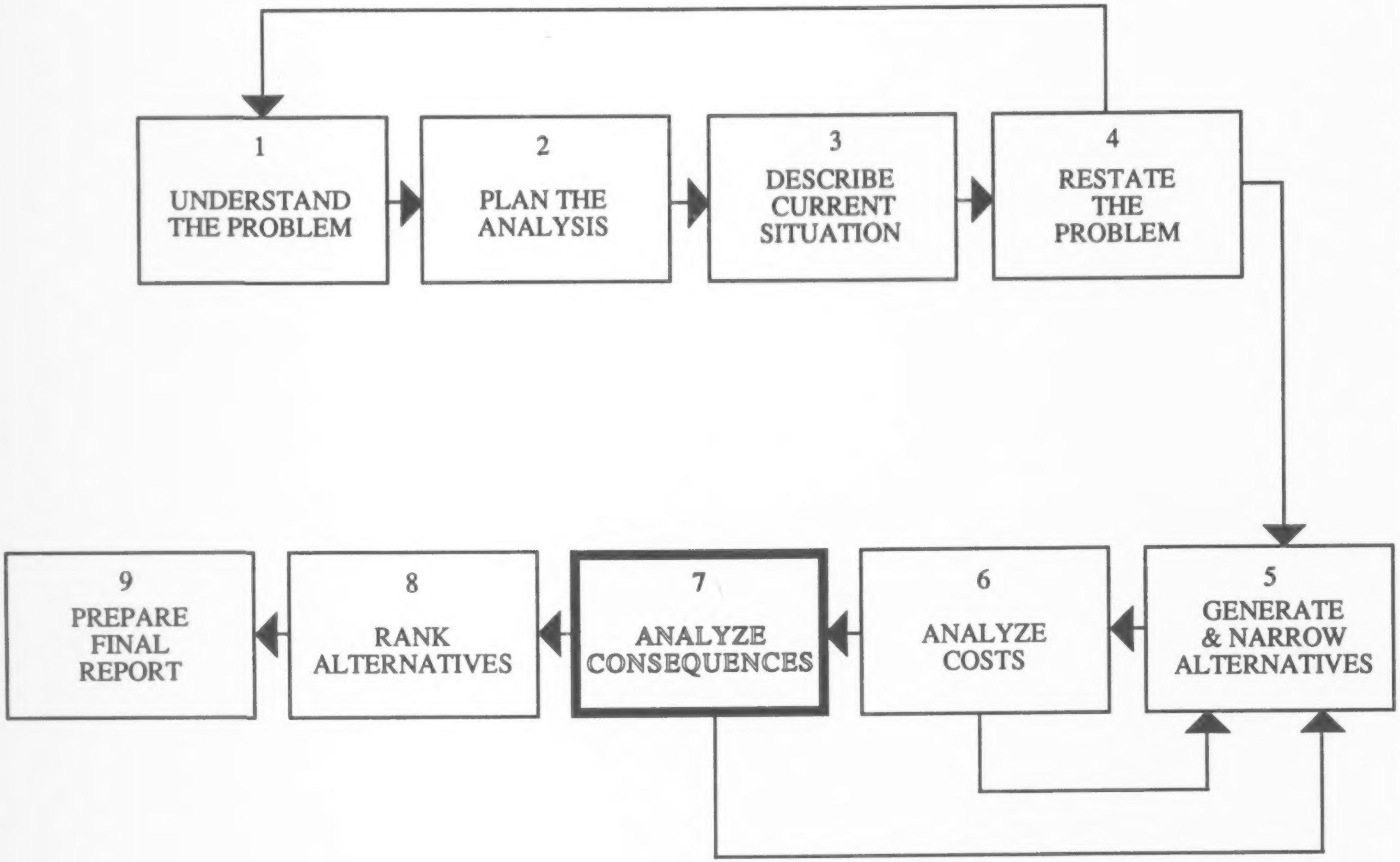

1 UNDERSTAND THE PROBLEM

2 PLAN THE ANALYSIS

3 DESCRIBE CURRENT SITUATION

4 RESTATE THE PROBLEM

5 GENERATE & NARROW ALTERNATIVES

6 ANALYZE COSTS

7 ANALYZE CONSEQUENCES

8 RANK ALTERNATIVES

9 PREPARE FINAL REPORT

STEP 7
ANALYZE ALL CONSEQUENCES

OBJECTIVE 7.1

Identify Implications and Effects

OBJECTIVE 7.2

**Separate Effects Into
Quantifiable and Non-quantifiable**

OBJECTIVE 7.3

**Make Projections
of Quantifiable Effects**

IDENTIFYING IMPLICATIONS AND EFFECTS

Identifying Implications and Effects
Explanatory Text

Explanatory Text

When analysts consider a possible action, if they are to use analytic methods, they must consider the consequences of the action in question as compared with the consequences of alternatives (including the alternative of doing nothing). This requires identifying the implications or effects of the proposal. Of course, we do something because we want a particular result -- the intended effects of an action are usually obvious and easy to identify. What is more difficult, but very helpful to making good decisions, is the identification before the fact of the consequences that were not the main purpose of the action: the unintended effects and the side effects.

One cannot hope to be perfect: if we knew the future with certainty, we would have no problems with analysis. But comparison with similar former actions, or like actions in other times and places, or just careful reflection and thinking through of how the action will affect everything and everyone who has a connection with the object of the action, may permit the identification of at least some of the more important unintended effects of actions, both positive and negative.

An interesting example of unanticipated negative consequences can be drawn from the Aswan Dam experience. The construction of the Aswan High Dam in Egypt led to better flood control, more electricity, and better irrigation. However, there were also numerous negative consequences, not all of which were foreseen. They included a decline in the fertility of the Nile Delta; exhaustion of soils leading to greater reliance on chemical fertilizers; more erosion of the river bed; increased water pollution; and severe problems with certain diseases. Some analysts suggest that if all the negative consequences had been foreseen, the Dam might never have been built.

On the other hand, some interesting positive side-effects of the introduction of microcomputers into schools in an experiment in Kenya were seen. First, the authority structure of teachers and students was modified in a positive way: student experts emerged as valuable classroom members, causing a healthy reexamination of previous status structures, and leading to more productive use of the microcomputers, as well as a more democratic environment in general. Second, teachers were thus free to examine creative restructuring of their curriculum, as a result of the introduction of this new tool. Of course, the explicit goals of such technological innovations are typically the improvement of student academic performance, and too narrow a focus on such outcomes may lead to ignoring the other positive effects which may occur.

Example

Example

In the example of the peer teaching literacy program, here are some of the possible anticipated and unanticipated consequences, both positive and negative. Notice that some of the negative consequences have already been identified as "costs."

Positive
- Student reading scores will improve (program goal)
- Peer teachers will themselves learn to read better
- Younger students will learn other skills from older children
- Artificial age barriers will be partially broken down
- District supervisors will be able to serve in other integrating capacities

Negative

- Teacher claims to professional status may be eroded
- Younger students may not learn appropriate socialization skills in the absence of an adult
- Peer teachers' achievement may decline in other subject areas due to time spent teaching.
- Schools may experience space difficulties due to the need for extra class rooms

Task

TASK

Returning to the Case Study, make a list of at least five negative and five positive consequences of each of the proposals for improving teacher quality.

OBJECTIVE 7.2

SEPARATING EFFECTS INTO QUANTIFIABLE AND NON-QUANTIFIABLE

Separating Effects Into Quantifiable and Non-Quantifiable

Explanatory Text

Explanatory Text

Much as the costs of a proposal may be expressed either in monetary or non-monetary terms, so can the consequences of an action be classified as either quantifiable or non-quantifiable. In the case of the Aswan Dam, most of the effects mentioned are quantifiable (fewer floods, more electricity, decline in fertility, erosion, pollution), although the social upheaval caused by these factors probably cannot be quantified as directly. In the case of the introduction of microcomputers in classrooms in Kenya, most of the effects are non-quantifiable (change in authority relations, increased teacher creativity), except for student achievement.

Example

Example

In the case of the peer teacher literacy program, the consequences could be categorized as quantifiable or non-quantifiable as follows:

Quantifiable
- Student reading scores will improve (program goal)
- Peer teachers will themselves learn to read better
- Peer teachers' achievement may decline in other subject areas due to time spent teaching.
- Schools may experience space difficulties due to the need for extra classrooms

Non-quantifiable
- Younger students will learn other skills from older children
- Artificial age barriers will be partially broken down
- District supervisors will be able to serve in other integrating capacities
- Teacher claims to professional status may be eroded
- Younger students may not learn appropriate socialization skills in the absence of an adult

TASK

Task

Returning to the list of positive and negative consequences for each of the proposals for improving teacher quality, categorize each as quantifiable or non-quantifiable.

Making Projections of Quantifiable Effects
Explanatory Text

OBJECTIVE 7.3

MAKING PROJECTIONS OF QUANTIFIABLE EFFECTS

Explanatory Text

Once it is determined which consequences of proposed policies are quantifiable and which are not, the next step in analyzing the consequences is to project quantifiable effects over the course of the proposals. Such projections are always estimates, of course, since the precise outcomes of policy actions cannot be known in advance. People in their social and cultural context do not behave as they do in laboratories; nor can one expect identical policies to have identical outcomes with a different group of people, or in a different setting, or at a different time.

Thus, one must make assumptions to project policy outcomes. One should collect as much information as possible about what has happened in the past to make projections plausible. A few sources for such information are the following:

Studies of the effects of similar programs. In the case of the peer teaching literacy program, for example, are there available any evaluations of peer teaching programs which report the reading score improvement of students who have been taught by older students? How comparable are the settings and implementation of these programs?

Evidence drawn from an analysis of the current situation. When a policy is designed to bring certain people to a level or state held by others, can an analysis be conducted which estimates the outcomes, based on what we already know about the people already at that level? For example, if we would like to estimate improvement in teacher competency test scores which will occur as a result of increasing the number of certified teachers, we might seek such information as the average test score of certified teachers in our projection. Of course, this may be a spurious figure, due to other factors, as we have seen before. Nevertheless, using such figures is probably more legitimate than making unsupported, top-of-the-head estimates: at least everyone will know where they came from. In the event that one would like to separate the spurious effects from the "real" effects, one may use such techniques as regression analysis, but these have problems of their own as well, and are, themselves, based on many assumptions.

Professional judgment and expertise. When the above type of data are not available, one may still be able to find estimates made by professionals and consultants of the effects of programs. Of course, these reports must be evaluated for credibility, but, again, they often add a component of legitimacy to estimates, and are better than pure guesswork.

The estimates of projected effects of policies is done much in the same way as others you have done. It is also often useful to make a projection for the situation where no policy is implemented for comparison purposes.

Example

Example

In the peer teaching literacy program, an evaluation of a similar program has been published which estimates that the average reading gain of a second-year primary student who is taught by a peer teacher for one year is 1.2 years; the average gain for a student taught in a traditional setting is 1.0 years; and the average gain for a student of this age group not in school is 0.2 years.

Here is how we will go about making this projection:

a) The current distribution of reading levels of second year primary students in the four counties is:

2000 students reading above level 2, at an average of 2.2.
1000 students reading below level 2, at an average of 1.7.
This works out to an overall average level of
(2.2 x 2000 + 1.7 x 1000) / 3000 = 2.03.

b) The 2000 students who will continue with traditional classes are expected to gain 1.0 points per year for 3 years.

c) The 1000 students in the peer teaching program are expected to gain 1.2 points per year for 3 years.

d) Average reading scores of the two groups are expected to progress as follows:

Year	Traditional	Peer Teaching
0	2.2	1.7
1	3.2	2.9
2	4.2	4.1
3	5.2	5.3

e) The mean reading score in the four districts after three years of program is thus expected to be:

(5.2 x 2000) + (5.3 x 1000) = 5.23

TASK

Task

Using data from the following table describing teacher scores on the competency examination, broken down by level of training certification, project the quantifiable outcomes of each of the proposals for improving teacher quality. Keep a detailed record of your computations, and write a summary of your results.

MEAN SCORES ON TEACHER COMPETENCY EXAMINATION BROKEN DOWN BY LEVEL OF TRAINING PRIMARY SCHOOL TEACHERS

		Mean Scores	
Level of Training	Professional Knowledge	Classroom Performance	Total Score
Teacher Training College Diploma	21.3	27.4	48.7
In-Service Certificate (8-week course)	13.3	23.2	36.5
Not Certified	10.3	15.0	25.3

* Maximum scores are: 25 points for Professional Knowledge
40 points for Classroom Performance
65 points Total Examination

Source: World Educational Testing Service Report, 1983.

8

RANK ALTERNATIVES

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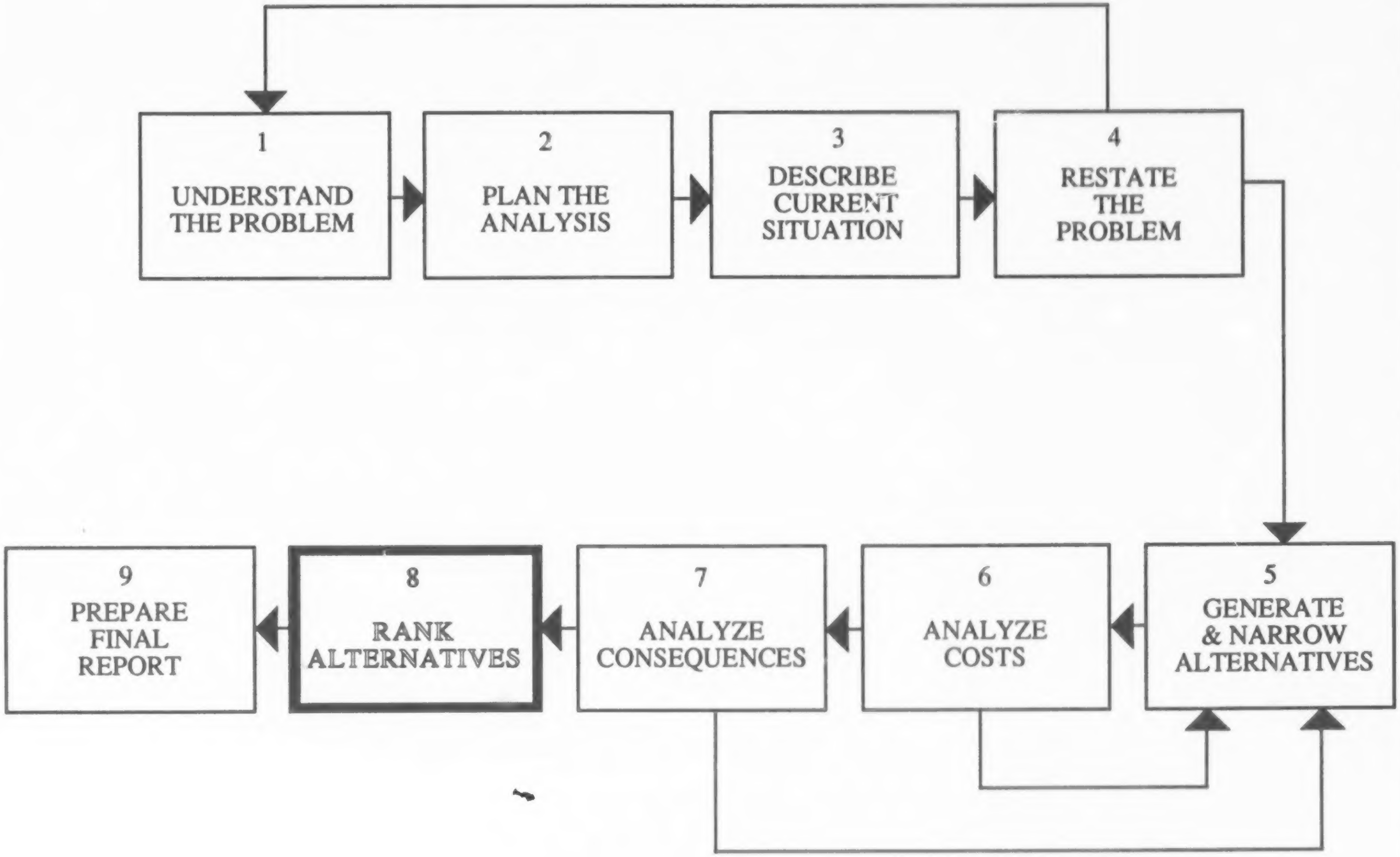

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7 ANALYZE CONSEQUENCES

8 RANK ALTERNATIVES

9 PREPARE FINAL REPORT

STEP 8
RANK ALTERNATIVES

OBJECTIVE 8.1

Understand Cost-Benefit Analysis

OBJECTIVE 8.2

Understand Cost-Effectiveness Analysis

OBJECTIVE 8.3

Understand Cost-Utilities Analysis

Introduction to Objective 8

The basic economic approach to decision making is to identify all the consequences of an action; to divide them into positive (benefits) and negative (costs), and also into quantifiable and non-quantifiable; and then to compare the benefits to the costs.

If all effects are quantifiable in monetary terms, this can be done in quantitative terms and would seem almost mechanical -- if the benefits exceed the costs, the action is desirable; if the costs exceed the benefits, the action is undesirable. However, usually someone must exercise judgment, since some effects will not be fully quantifiable, and some of those that are quantifiable will not be easily converted into money values in a noncontroversial way. Thus the best that can be done will be to provide as much information as possible on benefits and costs, some of which will not be directly comparable because they are not all expressed in quantifiable terms.

Three techniques will be discussed in this section:

a) Cost-benefit analysis, which is used when benefits can be expressed in monetary terms;

b) Cost-effectiveness analysis, which is used when benefits can be expressed in quantifiable, but non-monetary terms;

c) Cost-utility analysis, which is used when benefits cannot be quantified directly.

Understanding Cost-Benefit Analysis

Explanatory Text

Cost-benefit analysis is used when costs and benefits can be meaningfully expressed in monetary terms. This technique will not be discussed in great detail in this workshop, since the use of cost- benefit analysis presents technical difficulties which are difficult to overcome in a quick decision situation.

The challenge of this technique comes in the difficulties of translating the effects of educational programs into monetary outcomes. This would seem less difficult in, say, agricultural programs, where crop yields can easily be quantified in money terms, although even here there is usually considerable debate concerning the quantification of effects.

When used in educational decision-making, one may see cost-benefit analysis applied at an individual level of analysis to such questions as the relative merit of vocational programs versus academic programs. In such cases, "rates of return" to education are computed by attempting to estimate the money value to an individual of attending a job preparation program, as opposed to the money value of attending a year of general education. Then, costs of each program are divided by these respective rates of return in order to compute the monetary benefit per monetary cost of each program. Of course, many other factors may contribute to an individual's earning power, and herein lies the difficulty of computing rates of return.

At the societal level, monetary outcomes may be computed in such terms as increases in Gross National Product which are the consequence of a better educated population (or a more literate population). Again, the assumptions involved in imputing a causal dimension to education or literacy in the improvement of national productivity are contestable, both in theory and in practice.

OBJECTIVE 8.2

Understanding Cost-Effectiveness Analysis

Explanatory Text

Understanding Cost-Effectiveness Analysis

Explanatory Text

Often, most or all of the costs of an action can be identified, quantified, and valued, but all or many of the benefits cannot be valued in money terms. If the benefits can be quantified in commensurable units, such as reading score gains, or points on a teacher competency examination, cost-effectiveness analysis is an appropriate technique for comparing alternatives.

The basic purpose of cost-effectiveness analysis is to calculate the monetary cost needed to achieve one unit of the expected benefits of a policy proposal. When weighing several proposals, we find the cost of attaining a unit of the objective by alternative means, and compare those costs to show how effective (in the sense of least cost) the alternatives are as ways of achieving the desired objective.

Cost-effectiveness analysis may be conducted in various ways, depending on the level of analysis. If outcomes are being analyzed at the level of the individual student, for example, one may divide the unit cost of a program by the predicted outcome to find out how much it will cost to provide one unit of outcome. If outcomes are being analyzed at the system level, one may divide the total cost of a program by the predicted outcome to find the cost per unit of outcome.

Example

Example

In the peer teaching literacy program example, we could conduct a cost-effectiveness analysis in at least two different ways, one at the individual level, and one at the system level:

Individual level:

- We know from our analysis in Exercise 6.6 that the unit cost of the peer teaching program is 121.43.
- We know from the evaluation report cited in Exercise 7.3 that the average expected gain in reading score for a student in the peer teaching program is 1.2 years on a reading examination.
- To compute the cost per year of reading score gain, we divide cost by gain to get a cost-effectiveness measure:

  121.43 / 1.2 = **101.19**

System level:

- We know from our analysis in Exercise 6.5 that the total cost of the peer teaching program is 364,300.
- We know from the projections computed in Exercise 7.3 that the predicted mean reading score in the four districts after three years of the peer teaching program is expected to be 5.23.

- To compute the cost-effectiveness of the overall program, we divide overall cost by predicted outcome:

  364,300 / 5.23 = **69,656**

TASK

Task

Using the projections of quantifiable outcomes you computed in Step 7.3, and the costs you projected in Step 6.5, conduct a cost- effectiveness analysis for each of the proposals for improving teacher quality. Which of the proposals is more cost-effective?

Write a summary paragraph describing your results.

OBJECTIVE 8.3

Understanding Cost-Utility Analysis
Explanatory Text

UNDERSTANDING COST-UTILITY ANALYSIS

Explanatory Text

If the benefits of each alternative cannot be quantified, or cannot be expressed in the same units, so that they cannot be compared quantitatively, cost-effectiveness analysis is not usable. The cost- utility approach is a technique for combining the opinions of several individuals in a systematic way in order to assist with group ranking of alternatives. There are a number of ways in which to proceed, one of which will be presented here. The steps are as follows:

a) The group agrees on a list of all the consequences of each alternative, including the alternative of doing nothing.

b) The group agrees on the money values to be associated with those costs which can be valued.

c) Each member of the group ranks all the alternatives, including the alternative of doing nothing, in terms of their benefits and those costs that cannot be valued. That is, money costs are to be ignored in this ranking.

d) Each member then awards zero points to the alternative that is least desirable in his or her opinion, and 100 points to the alternative that is most desirable in his or her opinion.

e) Each member then awards each of the other alternatives a point-value between zero and 100 according to how their net benefits and non-monetary costs compare to the best (100 points) and worst (zero points).

f) Each individual's point awards are then averaged for each alternative and divided by money cost.

g) This then gives a basis for ranking the alternatives by cost-utility, i.e., points per CFA (or whatever), reflecting the combined opinions of all the members of the group.

Example

Example

Continuing with the example of programs to increase the literacy rate, let us suppose that three programs have been retained for consideration, including the peer teaching program. The monetary costs for each proposal have been computed, and all non-monetary consequences, both positive and negative, have been discussed by the group and placed on the blackboard. This has also been done for the option of doing nothing.

Now, each group member assigns a score of zero to his or her least valued proposal (ignoring monetary cost), a score of 100 to his or her most valued proposal, and scores between zero and 100 to the other two:

Monetary costs:

Proposal 1: 364,300
Proposal 2: 670,000
Proposal 3: 568,400
Proposal 4 (no action): 80,000

Members' rankings:

	Proposal 1	Proposal 2	Proposal 3	Proposal 4
Member 1	80	100	70	0
Member 2	50	70	100	0
Member 3	75	0	100	20
Member 4	70	100	60	0
Member 5	100	70	80	0
Average:	75	68	82	4

The average scores are then divided by the monetary cost (in thousands of CFA's) for each proposal, and the final ranking reported as "utility points" per CFA:

Proposal 1: 75 / 364.3 = .206 Ranked # 1
Proposal 2: 68 / 670.0 = .102 Ranked # 3
Proposal 3: 82 / 568.4 = .144 Ranked # 2
Proposal 4: 4 / 80.0 = .050 Ranked # 4

TASK

Task

Continuing with the Case Study, conduct a cost-utility analysis comparison for the proposals for improving teacher quality. Which of the proposals is the preferred one according to this technique? Is it the same one as in the cost-effectiveness study from the previous step?

Write a summary paragraph describing your results.

Finally, as a group, on the basis of your cost-effectiveness and cost-utility analyses, decide which of the proposals you will recommend to the Minister. Write a summary paragraph stating your proposed action, and the group's justification for the selection.

9

PREPARE FINAL REPORT

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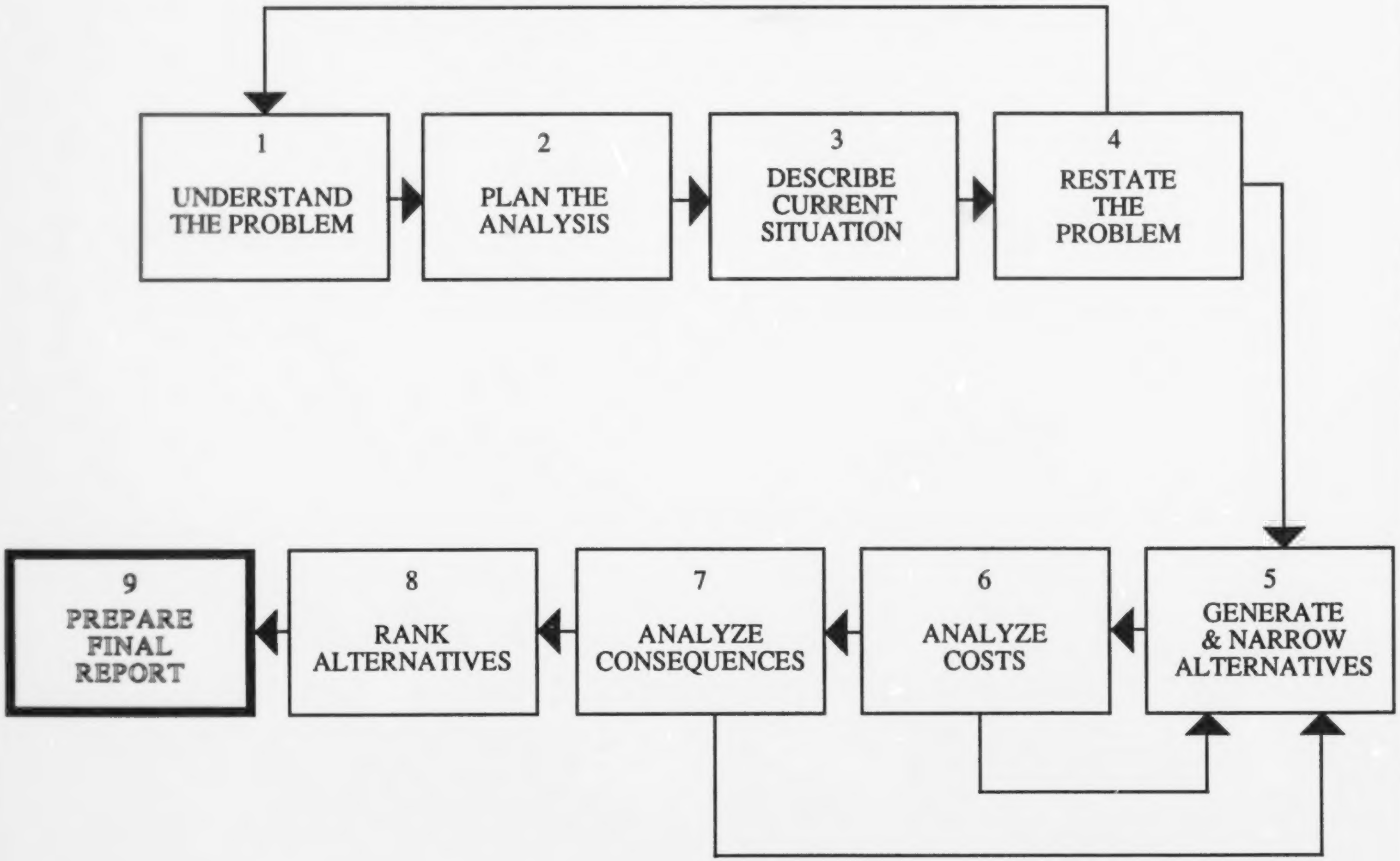

1
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8
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PREPARE FINAL REPORT

STEP 9

PREPARE FINAL REPORT

OBJECTIVE 9.1

Outline Written Reports

OBJECTIVE 9.2

Draft Written Reports

OBJECTIVE 9.3

Rewrite and Revise
Written Reports

OBJECTIVE 9.4

Oral Presentation

OBJECTIVE 9.1

OUTLINING WRITTEN REPORTS

Explanatory Text

Outlining Written Reports

Explanatory Text

Outlining a report before it is written serves several useful purposes:

a) It permits early agreement within a group on the main features of the report and its structure.

b) It allows a division of labor within a group, some members being assigned to write some sections, and other member to work on other sections. This permits the report to be written quickly, and without too many surprises because of different writers coming to different conclusions about content.

c) It serves as a useful tool in planning the general attack on the problem. If an initial draft of the outline of the final report is drawn up at the same time as the group plans its attack on the problem, often the process of drafting the outline will demonstrate difficulties or lines of inquiry that were previously overlooked.

d) An outline gives the analysts the skeleton onto which they will place the body of their findings; hence it helps guide their work and remind them of the direction in which they are going.

Note however, that outlines should never be regarded as fixed. If the process of gathering evidence, assessing it, and analyzing the information available results in a different way of seeing the problem, the outline should be revised to reflect the new view. Working to an outline and revising the outline as necessary is a particularly useful way of keeping everyone up-to-date, especially when a group has divided the tasks up between them.

TASK

Task

Continuing with the Case Study on the improvement of teacher quality, finalize the outline for the final report to the Minister.

You will want to begin by considering the following outline, which has been developed for this particular case, and is based on the sections you have already written for the previous exercises. However, you should feel free to modify it as you see fit.

OUTLINE FOR FINAL REPORT TO MINISTER

I. Introduction (from Step 1.1)

   a. Who requested the report?
   b. What is the reason for the report being written?
   c. What is the context of the report?
   d. Who prepared the report?
   e. What information was used?

II. Summary of conclusions

III. Description of current situation

   a. National percentages of certified teachers, competency examination scores (from Step 3.1).
   b. Relationships between teacher certification levels and competency exam scores (from Step 3.3).
   c. Relationships between teacher certification levels and competency exam scores, in towns versus districts (from Step 3.4).

IV. Restatement of the problem

   a. Projections of numbers of certified teachers in 1989 (from Step 4.2).
   b. Statement of goals and targets (from Step 4.3).

V. Analysis of proposed solutions

   a. Statement of the two or three proposals considered (from Step 5.4).
   b. Total costs and unit costs of the proposals considered (from Steps 6.5 and 6.6).
   c. Projected outcomes of the proposals considered (from Step 7.3).
   d. Cost-effectiveness analysis (from Step 8.2).
   e. Cost-utility analysis (from Step 8.3).

VI. Conclusions and recommendations

   a. Proposed action and justification (from Step 8.3).
   b. Limitations and recommendations for further data needs.

VII. Appendices

OBJECTIVE 9.2

Drafting Written Reports
Explanatory Text

DRAFTING WRITTEN REPORTS

Explanatory Text

The following include a few suggestions for what to look for in writing the report, organized by broad sections contained in most such documents:

Title:
This should not only be a concise description of the subject, it should also specify who prepared the report, and the date it was prepared.

Introduction:
This section should orient the reader to the reasons for the report being written, and should state the problem being addressed. Even the person who requested the report will appreciate a statement of the context of the report, and should be able to see immediately the direction in which the analyst proceeded. In very short reports prepared quickly, that may be all that is needed.

In fuller reports, the introduction should also contain: who asked for the report; who did the analysis; where and how the information and data used in the analysis were obtained; what the scope and limits of the analysis and report are; and acknowledgements of assistance received by the analysts.

Summary of Conclusions and Recommendations:
Persons reading the report will wish to know the conclusions and recommendations at the very beginning, even though a detailed argument and justification will be made later in the report. This should be very concise, and should give the gist of the report in a fashion that is easily understandable to, and likely to interest, the readers to whom the report is addressed.

Substantive text:
This is the section of the report which most requires outlining: what analyses and alternative courses of action are going to be considered? This section presents the analysis of the current situation, makes deductions about what has happened, what is likely to happen, and what should be done.

The text should not be overladen with detailed evidence, but should be reasonably easy to read and should flow continuously. Large masses of data, tables, charts, and diagrams should generally go into appendices and only be referred to in the main text.

Conclusions and Recommendations:
This states what the analysis found and what the analysts recommend. Its content should flow logically from the evidence and discussion in the substantive text of the previous section.

The conclusions and what the analysts think should be done must be stated briefly but precisely and with great clarity: it should be impossible for the reader to misunderstand. Not only should the actions the analysts are recommending be clear, but also who should take them and when.

Appendices:
These contain materials that are too long, voluminous, or detailed to go in the main text, but which are necessary in order to establish the evidence and conclusions of the report.

When working under severe time pressure, if the outline has been agreed upon during the planning stages, often parts of the final report can be delegated to particular members to draft as the analysis process takes place. Then, when the analytic work is complete, drafts of most of the report should already exist. Only a few key sections will remain to be drafted.

Task

TASK

Using the outline for the final report developed in the previous step, assign various sections to different members of the group, and draft the final report.

OBJECTIVE 9.3

Rewriting and Revising Written Reports

Explanatory Text

Rewriting and Revising Written Reports

Explanatory Text

Reports which are written by several members of a team will inevitably be stylistically varied, and they may also contain inconsistencies of analysis or evidence, no matter how careful the outlining process was. Almost always it is essential to rewrite and to revise. Here 'revise' refers to changing the substantive content of the report; 'rewrite' to changing only the wording or presentation. After the complete report is drafted, all members of the group should read it in its entirety. Actual rewriting is usually best done by a single individual, who receives comments from others. Having the final draft prepared by one person helps smooth over the stylistic differences which existed in the first draft. In reading over the first draft, bear in mind the following things:

Substantive content
Does the report conclude and recommend that which was agreed upon by the group? If the content need to be modified, someone must be assigned to draft the new material.

Organization
One needs to check the order in which ideas, conclusions, recommendations, and evidence are presented-- will they be most easily understood and most persuasive in the order chosen, or would an alternative be better?

Balance
Are some parts very detailed, while others are too sketchy?

Brevity
Are words concise, not unnecessarily technical? Are sentences short and to the point? Are there unnecessary details or qualifications?

Clarity
Is the report easy to understand? Can one follow the conclusions and recommendations without reading the body of the report? Is the substantive text sufficiently supported without having to plow through the appendices?

Language
Are spelling, syntax, and grammar all correct? Sloppy language discredits the substance of a report in the eyes of many readers.

TASK

Task

Revise the final report. Prepare it for submission.

Oral Presentation

Explanatory Text

The policy analyst should bear in mind that, no matter how well written and reasoned a final written report may be, an oral presentation delivered to a minister or a committee may carry as much weight in terms of persuasiveness as the document itself. This is especially true in quick turnaround decisions, where the office which commissioned the report needs to act quickly and decisively. A well-organized oral presentation will surely lend legitimacy to the written document; it will frame the mood of acceptance of the top-level decision maker. Following are some points to bear in mind for preparing oral presentations:

Don't read the report--use notes
When a report has to be presented orally as well as written, there is usually not enough time to read the whole report. Even if there were, written reports are not effective when read aloud. Instead, oral presentations should be made from notes, not read.

Focus on important points
One should concentrate on the most important points. While the audience should be given a clear justification of how the conclusions and recommendations were arrived at, evidence should not be examined in excessive detail. It is better to use examples, not statistical rigor, in discussing evidence.

Although brevity is important, a certain amount of repetition may be desirable. Do not overdo repetition, but it is often worthwhile to say the things that are really important more than once in different words. For example, you might start your presentation by saying very briefly what the most important conclusion or recommendation is, then explain your analysis, and then repeat the conclusion when you have explained how it was arrived at.

Tailor your presentation to your audience
First, you should know who will be present at the oral presentation. Think hard about the audience: what do they know already? what do they expect to hear? what kind of reasoning or evidence will they find most persuasive? what will be their attitude to your recommendations or conclusions -- will they be receptive or doubting or hostile? what will be the best strategy for persuading them? Avoid telling the audience what it already knows, which both wastes time and runs the risk of insulting the audience.

Use visual aids
If visual aids-- graphs, charts, tables, diagrams-- would help to present the evidence, either on sheets of paper, on overhead projectors, or in some other way, by all means use them. Visual aids often help divert the focus from the wordiness of a technical report, thus making the report more interesting. But be sure they are well-prepared and help to make the point desired, or they will divert attention from the message you are trying to deliver in a counter-productive way.

Keep the oral presentation short
Do not plan to speak for a long time. Short, to the point presentations are almost always much more effective than long ones; few people can really pay careful attention to a single voice for more than 20 minutes or so without some kind of break. If you have to make a much longer presentation, consider breaking it into parts and having more than one person do different

pieces; or build in visual aids or illustrative examples of evidence at intervals to change what the audience has to do.

Practice the oral presentation

Be sure to have a dry run of the oral presentation at least once. If you have an allotted time period, be sure that you can complete the report within that time. If there is more than one presenter, everyone must understand his or her responsibility. If visual aids are being used, they must be well-organized and accessible. If overhead or slide projectors are being used, be sure that someone in the group knows how to operate them.

TASK

Task

Prepare the oral report. Present it at a plenary session of all groups.